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Proposed Best Demonstrated Available Technology (BDAT) Background Document for Halogenated Pesticide and Chlorobenzene, Halogenated Phenolic, and Phenolic Wastes. Volume 16

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7. Author(s)
BERLOW/CUNNINGHAM/OSW

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U.S. EPA
Office of Solid Waste
401 M. Street SW
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This background document provides the Agency's rationale and technical support for selecting constituents being proposed for regulation and for developing treatment standards for htese wastes. This document also provides waste characterization data that serve as a basis for determining whether a variance from treatment standards may be warranted for a particular halogenated pesticide and chlorobenzene, halogenated phenolic waste that is more difficult to treat than the wastes that were tested and from which treatment performance data were used to develop the treatment standards for the wastes included in this background document.

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PROPOSED

BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

BACKGROUND DOCUMENT

FOR

HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES

James R. Berlow
Chief, Waste Treatment Branch

Mary Cunningham
Project Manager

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Solid Waste
401 M Street, S.W.
Washington, D.C. 20460

November 1989

Note: This proposed Background Document is being issued in support of the Agency's proposed rulemaking for the land disposal restrictions program. The Agency solicits comments on the proposed rule and on this proposed Background Document. This document will be issued in final form, appropriately revised in response to comments, at the time of promulgation of the final rule.

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1.0 INTRODUCTION

1.1 Regulatory Background

Section 3004(m) of the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) on November 8, 1984, requires the U.S. Environmental Protection Agency (EPA or the Agency) to promulgate treatment standards for certain hazardous wastes based on the Best Demonstrated Available Technology (BDAT) for these wastes. More than 500 of these hazardous wastes were listed as of December 1988 (see Title 40, Code of Federal Regulations, Part 261 (40 CFR Part 261)). The Agency has divided the listed hazardous wastes into five groups to determine whether further land disposal is protective of human health and the environment (see 40 CFR Part 268). The five groups and their respective dates of promulgation of treatment standards are:

o Solvent and dioxin wastes	November 7, 1986
o "California List" wastes	July 8, 1987
o "First Third" wastes	August 8, 1988
o "Second Third" wastes	June 8, 1989
o "Third Third" wastes	on or before May 8, 1990

Several wastes included in this schedule were regulated ahead of schedule, and several wastes in the "First Third" or "Second Third" group of wastes were deferred to the "Third Third" group of wastes. Treatment standards for the "Third Third" wastes will become effective no later than May 8, 1990. On or after this date, wastes that are regulated in the "Third Third" rulemaking must comply with applicable treatment standards prior to "land disposal" as defined in 40 CFR Part 268.

Generally, treatment standards are specified for each listed hazardous waste. These standards are applicable to the wastes as listed as well as to any wastes generated by the management or treatment of the listed waste. For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1% (weight basis) total suspended solids* and less than 1% (weight basis) total organic carbon (TOC). Wastes not meeting the wastewater definition must comply with treatment standards for nonwastewaters.

The specific waste codes that are the subject of this document are listed in Table 1-1 by waste code and include D, U, P, and K wastes. These wastes have been combined into seven waste treatability groups within the subcategories of halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic wastes, as discussed in Section 2.3. (Although certain wastes are included in the halogenated pesticide and chlorobenzene subcategory, these wastes are not necessarily pesticides as defined by the Office of Pesticides and Toxic Substances.) This background document provides the

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*The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, total suspended solids are measured by Method 209c (Total Suspended Solids Dried at 103 to 105°C in Standard Methods for the Examination of Water and Wastewater (Reference 1).

Agency's rationale and technical support for selecting constituents being proposed for regulation and for developing treatment standards for these wastes. This document also provides waste characterization data that serve as a basis for determining whether a variance from treatment standards may be warranted for a particular halogenated pesticide and chlorobenzene, halogenated phenolic, or phenolic waste that is more difficult to treat than the wastes that were tested and from which treatment performance data were used to develop the treatment standards for the wastes included in this background document.

A D-pesticide waste is a waste from a non-specific source that exhibits any characteristics of EP Toxicity of specific pesticides as described in 40 CFR 261.24. A solid waste exhibits the characteristics of EP Toxicity if the extract of the waste contains pesticides concentrations equal to or greater than those given in Table I of 40 CFR 261.24.

U or P wastes consist of a commercial chemical product or manufacturing intermediate from a non-specific source containing any of the chemicals listed in 40 CFR 261.33(e) or (f) and in which the listed chemical is the sole active ingredient. Commercial chemical products or manufacturing intermediates include all commercially pure grades of the listed chemical, all technical grades, and all formulated products in which the listed chemical is the sole active ingredient. In addition, an off-specification product that, if it met specification, would have the generic name included in either 261.33(e) or (f) is a U or P waste. Any residue that is a listed chemical remaining in a container or inner liner removed from a container that will not be recycled, reclaimed, or reused; or any residue or contaminated soil, water, or debris from a spill of such a chemical, is also a U or P waste. However, these wastes do not include manufacturing process wastes. A waste occurs when a product is:

- Discarded or intended to be discarded;
- Mixed with another material and applied to the land for dust suppression or road treatment;
- Applied to land in lieu of its original intended use; or
- Distributed or burned as a fuel or fuel additive.

U wastes are identified as toxic; P wastes are identified as acutely hazardous. Whether a waste is acutely hazardous or toxic generally has no bearing on its treatability.

Hazardous process waste streams from specific sources are listed as K wastes. They are identified as hazardous based on the characteristics of ignitability, corrosivity, reactivity, EP toxicity, acute hazard, and toxicity, as defined in Subpart C of 40 CFR 261.

1.2 Document Summary

This document provides the Agency's rationale and technical support for developing treatment standards for the wastes listed in Table 1-1. Section 2.0 of this background document presents the following waste-specific information: the approximate number and geographic distribution of facilities that may be affected by the land disposal restrictions for these wastes; the processes generating these wastes; and available waste characterization data. The Agency estimates that there are approximately 300 facilities that may be affected by this rule. The four-digit Standard Industrial Classification (SIC) codes associated with the pesticides industry are 2879 and 2869 (Pesticides and Agricultural Chemicals, Not Elsewhere Classified, and Industrial Organic Chemicals, respectively). Section 2.0 also includes EPA's rationale for combining these waste codes into seven treatability groups.

EPA's rationale for identifying BDAT for wastes included in this document is presented in Section 3.0. Specifically, BDAT has been identified to be incineration for nonwastewater and wastewater forms of all these wastes. In addition to incineration, BDAT for P034 wastewaters and salts in P047 wastewaters is wet air oxidation followed by carbon adsorption, chemical oxidation followed by carbon adsorption, and biological treatment followed by activated carbon. In addition to incineration, BDAT for salts and esters in U240 wastewaters is wet air oxidation followed by carbon adsorption, and chemical oxidation followed by carbon adsorption.

Alternate concentration-based treatment standards for all U and P wastewaters have also been developed based on additional wastewater treatment data from several technologies. These data and the corresponding treatment technologies are discussed in Reference 9 and are included in Sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble.

Section 4.0 contains treatment performance data that the Agency used to determine BDAT and proposed treatment standards for the wastes included in this document. The Agency has treatment performance data for nonwastewaters and wastewaters from two rotary kiln incinerator test burns EPA performed in June 1989 for waste constituents from several of the waste treatability groups. The Agency also has treatment performance data for nonwastewaters and wastewaters from 12 other incineration tests performed by EPA for previous rulemakings for the BDAT program.

Recently, additional wastewater treatment data, primarily from EPA's Office of Water, have been analyzed for the development of concentration-based treatment standards for many of the U and P wastes. These data include treatment performance data for wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P waste constituents. While these data were not available in time for incorporation into the preamble discussion or into this background document for specific wastes or waste treatability groups, these data are being placed in the administrative record for this rulemaking. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data, for all U and P wastewaters for which standards based on incinerator scrubber waters have been proposed. Further information on these alternative standards can be found in Sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble for the proposed rule and in the document Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents (Reference 9).

The Agency is also in the process of conducting wastewater treatment tests for selected U and P chemicals using wet air oxidation, powdered activated carbon treatment (PACT), and carbon adsorption. Since much of the currently available wastewater treatment data is from the treatment of relatively low concentrations of U and P waste constituents in industrial wastewaters, these tests have been designed to examine the applicability of treatment technologies to wastewaters containing relatively high concentrations of U and P constituents. The data developed in these studies are included in the administrative record for inspection and comment. Further information on the availability of the wastewater treatment test data can be found in Section III.A.1.h.(6.) of the preamble for the proposed rule.

EPA's rationale for selecting constituents for proposed regulation is presented in Section 5.0. Due to the lack of characterization data for most U, P, and D wastewaters and nonwastewaters, only the constituent for which the waste was listed is proposed for regulation. One exception is P034 (listed for 2-cyclohexyl-4,6-dinitrophenol). The Agency currently lacks analytical methods to quantitatively analyze for 2-cyclohexyl-4,6-dinitrophenol in complex waste matrices. In this case, the Agency is specifying a method of treatment as the BDAT treatment standard since, without analytical methods, establishing concentration-based treatment standards for 2-cyclohexyl-4,6-dinitrophenol would not be appropriate. Other exceptions include U052, P050, P051, P059, U060, U061, and U129 for which additional constituents other than those for which the wastes were listed were selected for proposed regulation. For K-pesticides wastewaters and nonwastewaters, one or more organic constituents were selected for proposed regulation based on available waste characterization data.

Section 6.0 includes the determination of proposed treatment standards for the halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic wastes. Tables 1-2 through 1-8 at the end of this section summarize the proposed treatment standards developed for wastes in each treatability group. The units used for total concentration of organic constituents are mg/kg (parts per million on a weight-by-weight basis) for the nonwastewater forms of these wastes, and mg/l (parts per million on a weight-by-volume basis) for the wastewater forms of these wastes.

BDAT treatment standards for D, U, and P wastes included in this document were determined based on treatment performance data from the 14 incineration tests discussed in Section 4.0. Alternate treatment standards for U and P wastewaters were determined based on treatment performance data from several sources of wastewater treatment data, as discussed in the Wastewater Background Document (Reference 9). Treatment performance data were not available for the K wastes included in this document. Therefore, the Agency transferred data from treatment from other wastes that possess chemical similarities and similar waste treatability to the given wastes as discussed in Section 4.0 to develop treatment standards.

For two waste codes, U240 (2,4-D and salts and esters) and P047 (4,6-dinitrophenol and salts), the Agency is proposing both concentration-based treatment standards and specifying a method of treatment as the treatment standard. Because 2,4-D salts and esters and 4,6-dinitrophenol salts are not analyzed as 2,4-D or 4,6-dinitrophenol, numerical treatment standards for 2,4-D and 4,6-dinitrophenol do not necessarily represent treatment of salts and esters of these wastes. Where a facility can reasonably assume that only 2,4-D or 4,6-dinitrophenol is being handled, only the concentration-based treatment standards for 2,4-D and 4,6-dinitrophenol would be applied. However, should one expect that salts or esters could be formed during storage, treatment, or disposal, the U240 and P047 nonwastewaters would have to be incinerated and the U240 and P047 wastewaters would have to be treated by wet air oxidation followed by carbon adsorption according to the standard for salts and esters.

The Agency is proposing two options for treatment standards for EP Toxic halogenated pesticides wastes (D012, D013, D014, D015, D016, and D017). The first option is concentration-based treatment standards based on the ability of incineration to destroy these pesticides to detection limits. This first option is consistent in approach with the proposed treatment standards for the corresponding U, P, and K wastes. These proposed standards are based on the analysis of total composition rather than analysis of EP or TCLP leachates. The second option is treatment to the appropriate characteristic levels as measured in the EP leachate.

Section 7.0 acknowledge the persons involved in developing the regulation of these wastes. Section 8.0 includes references cited in this document. Appendix A includes chemical structures for U, P, and D wastes included in this document. Appendix B includes plant codes listed in this document. Appendix C includes relevant QA/QC information corresponding to treatment performance data presented in Section 4.0. Appendix D includes variability factor calculations corresponding to treatment standard calculations presented in Section 6.0.

Table 1-1

WASTES INCLUDED IN THIS BACKGROUND DOCUMENT

Waste Code	Description of the Listed Waste
D012	EP Toxic for Endrin
D013	EP Toxic for Lindane
D014	EP Toxic for Methoxychlor
D015	EP Toxic for Toxaphene
D016	EP Toxic for 2,4-D
D017	EP Toxic for 2,4,5-TP (Silvex)
U036	Chlordane (alpha and gamma)
U037	Chlorobenzene
U038	Chlorobenzilate
U039	p-Chloro-m-cresol
U048	2-Chlorophenol
U052	Cresols
U060	DDD
U061	DDT
U070	1,2-Dichlorobenzene
U071	1,3-Dichlorobenzene
U072	1,4-Dichlorobenzene
U081	2,4-Dichlorophenol
U082	2,6-Dichlorophenol
U101	2,4-Dimethyl phenol
U127	Hexachlorobenzene
U128	Hexachlorobutadiene
U129	Lindane
U130	Hexachlorocyclopentadiene
U132	Hexachlorophene
U142	Kepone
U170	4-Nitrophenol
U183	Pentachlorobenzene
U185	Pentachloronitrobenzene
U188	Phenol
U201	Resorcinol
U207	1,2,4,5-Tetrachlorobenzene
U240	2,4-D, salts and esters
U247	Methoxychlor
P004	Aldrin
P020	Dinoseb
P034	2-Cyclohexyl-4,6-dinitrophenol
P037	Dieldrin
P047	4,6-Dinitro-o-cresol and salts
P048	2,4-Dinitrophenol
P050	Endosulfan

Table 1-1 (Continued)

WASTES INCLUDED IN THIS BACKGROUND DOCUMENT

Waste Code	Description of the Listed Waste
P051	Endrin and metabolites
P059	Heptachlor
P060	Isodrin
P123	Toxaphene
K032	Wastewater treatment sludge from the production of chlordane
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane
K041	Wastewater treatment sludge from the production of toxaphene
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane
K098	Untreated process wastewater from the production of toxaphene
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes

Table 1-2

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 1 (CHLORINATED NORBORNANE AND NORBORNENE DERIVATIVES)

PROPOSED BDAT TREATMENT STANDARDS FOR K032

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Hexachlorocyclopentadiene	2.0	0.047
Chlordane	0.13	0.00039
Heptachlor	0.066	0.00022
Heptachlor epoxide	0.066	0.00022

PROPOSED BDAT TREATMENT STANDARDS FOR K033

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Hexachlorocyclopentadiene	2.0	0.047

PROPOSED BDAT TREATMENT STANDARDS FOR K034

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Hexachlorocyclopentadiene	2.0	0.047

PROPOSED BDAT TREATMENT STANDARDS FOR K041

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Toxaphene	0.13	0.00039

PROPOSED BDAT TREATMENT STANDARDS FOR K097

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Hexachlorocyclopentadiene	2.0	0.047
Chlordane	0.13	0.00039
Heptachlor	0.066	0.00022
Heptachlor epoxide	0.066	0.00022

Table 1-2 (Continued)

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 1 (CHLORINATED NORBORNANE AND NORBORNENE DERIVATIVES)

PROPOSED BDAT TREATMENT STANDARDS FOR K098

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Toxaphene	0.13	0.00039

PROPOSED BDAT TREATMENT STANDARDS FOR D, U, AND P WASTES (GROUP 1)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
D012	Endrin	0.13	0.00052
D015	Toxaphene	1.3	0.014
P004	Aldrin	0.066	0.00024
P037	Dieldrin	0.13	0.00052
P050	Endosulfan I	0.066	0.00024
P050	Endosulfan II	0.13	0.00052
P050	Endosulfan sulfate	0.13	0.00052
P051	Endrin	0.13	0.00052
P051	Endrin aldehyde	0.13	0.00052
P059	Heptachlor	0.066	0.00022
P059	Heptachlor epoxide	0.066	0.00024
P060	Isodrin	0.010	0.00020
P123	Toxaphene	1.3	0.014
U036	Chlordane (alpha and gamma)	0.13	0.00044
U130	Hexachlorocylopentadiene	4.8	0.096
U142	Kepone	0.043	0.0011

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-3

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 2 (CHLOROBENZENES)

PROPOSED BDAT TREATMENT STANDARDS FOR K042

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
o-Dichlorobenzene	4.4	0.092
p-Dichlorobenzene	4.4	0.092
Pentachlorobenzene	4.4	0.092
1,2,4-Trichlorobenzene	4.4	0.092
1,2,4,5-Tetrachlorobenzene	4.4	0.092

PROPOSED BDAT TREATMENT STANDARDS FOR K085

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Benzene	4.4	0.092
Chlorobenzene	4.4	0.092
o-Dichlorobenzene	4.4	0.092
m-Dichlorobenzene	4.4	0.092
p-Dichlorobenzene	4.4	0.092
Pentachlorobenzene	4.4	0.092
1,2,4-Trichlorobenzene	4.4	0.092
1,2,4,5-Tetrachlorobenzene	4.4	0.092
Hexachlorobenzene	4.4	0.092
Aroclor 1016	0.13	0.00036
Aroclor 1221	0.13	0.00036
Aroclor 1232	0.13	0.00036
Aroclor 1242	0.13	0.00036
Aroclor 1248	0.13	0.00036
Aroclor 1254	0.13	0.00036
Aroclor 1260	0.13	0.00036

PROPOSED BDAT TREATMENT STANDARDS FOR K105

	Maximum for any Single Grab Sample Total Composition	
Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters (mg/l)
Benzene	4.4	0.092
Chlorobenzene	4.4	0.092
o-Dichlorobenzene	4.4	0.092
p-Dichlorobenzene	4.4	0.092
2-Chlorophenol	4.4	0.092
Phenol	4.4	0.092
2,4,5-Trichlorophenol	4.4	0.092
2,4,6-Trichlorophenol	4.4	0.092

Table 1-3 (Continued)

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 2 (CHLOROBENZENES)

PROPOSED BDAT TREATMENT STANDARDS FOR U WASTES (GROUP 2)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
U037	Chlorobenzene	5.7	0.014
U070	o-Dichlorobenzene	6.2	0.058
U071	m-Dichlorobenzene	6.2	0.072
U072	p-Dichlorobenzene	6.2	0.058
U127	Hexachlorobenzene	37	0.055
U183	Pentachlorobenzene	37	0.096
U185	Pentachloronitrobenzene	4.8	0.096
U207	1,2,4,5-Tetrachlorobenzene	19	0.023

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-4

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 3 (CHLOROPHENOXYACETIC ACID AND DERIVATIVES)

PROPOSED BDAT TREATMENT STANDARDS FOR D AND U WASTES (GROUP 3)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
D016	2,4-Dichlorophenoxyacetic acid	10	0.013
D017	2,4,5-TP (Silvex)	2.8	2.55
U240	2,4-Dichlorophenoxyacetic acid	10	0.013

PROPOSED BDAT TREATMENT STANDARDS FOR U240 - SALTS AND ESTERS OF 2,4-D
Nonwastewaters

INCINERATION AS A METHOD OF TREATMENT

PROPOSED BDAT TREATMENT STANDARDS FOR U240 - SALTS AND ESTERS OF 2,4-D
Wastewaters

WET AIR OXIDATION OR CHEMICAL OXIDATION FOLLOWED BY CARBON ADSORPTION OR INCINERATION AS A METHOD OF TREATMENT

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-5

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 4 (CHLORINATED DIPHENYLS)

PROPOSED BDAT TREATMENT STANDARDS FOR D AND U WASTES (GROUP 4)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
D014	Methoxychlor	0.18	0.00036
U038	Chlorobenzilate	6.6	0.29
U060	p,p'-DDD	0.087	0.00036
U060	o,p'-DDD	0.087	0.00036
U061	p,p'-DDT	0.087	0.00036
U061	o,p'-DDT	0.087	0.00036
U061	p,p'-DDE	0.087	0.00036
U061	o,p'-DDE	0.087	0.00036
U061	p,p'-DDD	0.087	0.00036
U061	o,p'-DDD	0.087	0.00036
U132	Hexachlorophene	1.1	58
U247	Methoxychlor	0.18	0.00036

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-6

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 5 (LINDANE AND HEXACHLOROBUTADIENE)

PROPOSED BDAT TREATMENT STANDARDS FOR D AND U WASTES (GROUP 5)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
D013	gamma-BHC (Lindane)	0.066	0.00024
U128	Hexachlorobutadiene	28	0.031
U129	gamma-BHC (Lindane)	0.066	0.00024
U129	delta-BHC	0.066	0.00024
U129	beta-BHC	0.066	0.00024
U129	alpha-BHC	0.066	0.00024

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-7

PROPOSED BDAT TREATMENT STANDARDS FOR HALOGENATED PHENOLICS

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
U039	p-Chloro-m-cresol	14	0.062
U048	2-Chlorophenol	5.7	0.056
U081	2,4-Dichlorophenol	14	0.052
U082	2,6-Dichlorophenol	14	0.018

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additiona information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

Table 1-8

PROPOSED BDAT TREATMENT STANDARDS FOR PHENOLICS

PROPOSED BDAT TREATMENT STANDARDS FOR P AND U WASTES (GROUP 1)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
P020	2-sec-Butyl-4,6-Dinitrophenol	2.5	0.036
P047	4,6-Dinitro-o-cresol	140	0.18
P048	2,4-Dinitrophenol	140	0.18
U170	4-Nitrophenol	65	0.18

PROPOSED BDAT TREATMENT STANDARDS FOR P034 AND P047 (SALTS)
Nonwastewaters

INCINERATION AS A METHOD OF TREATMENT

PROPOSED BDAT TREATMENT STANDARDS FOR P034 AND P047 (SALTS)
Wastewaters

WET AIR OXIDATION OR CHEMICAL OXIDATION FOLLOWED BY CARBON ADSORPTION OR BIOLOGICAL TREATMENT FOLLOWED BY CARBON ADSORPTION OR INCINERATION AS A METHOD OF TREATMENT

PROPOSED BDAT TREATMENT STANDARDS FOR U WASTES (GROUP 2)

		Maximum for any Single Grab Sample Total Composition	
Waste Code	Regulated Constituent	Nonwastewaters (mg/kg)	Wastewaters * (mg/l)
U052	p-Cresol (m- and p- isomers)	3.2	0.028
U052	o-Cresol	5.6	0.0066
U101	2,4-Dimethylphenol	14	0.045
U188	Phenol	6.2	0.091
U201	Resourcinol	1.8	8.2

* - Alternative standards for these U and P wastewaters are also proposed and are presented in Section III.A.7. of the preamble as standards for the corresponding chemical in wastewater forms of Multi-source Leachate. Additional information concerning these alternative standards is included in Section III.A.1.h.(6.)(b.) of the preamble.

2.0 INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

This section describes the industry affected by the land disposal restrictions for the wastes included in Table 1-1, the processes generating the wastes, the available characterization data, and the determination of waste treatability groups.

2.1 Industry Affected and Process Description

Facilities that generate the wastes listed in Table 1-1 include pesticide manufacturers, formulators, and packagers; agricultural experiment stations; chemical manufacturers; universities; military compounds; and treatment facilities throughout the United States. The Agency estimates that there are approximately 300 facilities that may generate these wastes. Table 2-1 at the end of this section lists by state and by EPA region the number of facilities known to currently manufacture, formulate, or package the waste constituents included in this document and that may generate the wastes of interest. Table 2-2 lists the total number of facilities that may generate each waste.

2.1.1 K Wastes

K032, K033, K034, and K097 are generated during the production of chlordane. K041 and K098 are generated during the production of toxaphene.

K042 is generated during the production of 2,4,5-T, and K085 and K105 are generated during the production of chlorobenzenes.

K032, K033, K034, and K097

A generic flow diagram illustrating the manufacturing process that generates K032, K033, K034, and K097 is presented in Figure 2-1 at the end of this section. As shown in Figure 2-1, cyclopentadiene is chlorinated to obtain hexachlorocyclopentadiene. The reaction products then pass through a decanter and filter for purification, before reaching a second reaction vessel. Hexachlorocyclopentadiene is then reacted with cyclopentadiene via the Diels Alder reaction to form chlordene. The chlordene is then chlorinated to form chlordane.

K033 is comprised of the water from the primary chlorinator unit and the decanter, along with the scrubber water from the primary chlorinator unit. The water and scrubber water are sent to wastewater treatment. Wastewater treatment sludge forms the listed waste K032. Filter solids generated from the hexachlorocyclopentadiene filtration step are the listed waste K034. The reaction by-products from the secondary chlorinator are vented to a vacuum stripper. The vacuum stripper discharges are the listed waste K097.

K041 and K098

A generic flow diagram illustrating the manufacturing process that generates K041 and K098 is presented in Figure 2-2 at the end of this section.

As shown in Figure 2-2, -pinene is reacted with a catalyst to form camphene, which is then chlorinated to form a toxaphene solution. This solution is then stripped to yield purified toxaphene product. Waste hydrochloric acid gas from the chlorinator passes through a water absorber, scrubber, and neutralizer, and the resulting hydrochloric acid is recovered or neutralized and sent to wastewater treatment.

Wastewater is generated from the toxaphene production process from leaks, spills, and washdowns, as well as from the scrubbing of vent gases in the hydrochloric acid absorption and recovery step. This wastewater is the listed waste K041. Wastewater treatment sludge is generated from the addition of diatomaceous earth and lime to the wastewater; these materials act as sorption agents for the removal of toxaphene from the wastewater. This wastewater treatment sludge is the listed waste K098.

K042

A generic flow diagram illustrating the manufacturing process that generates K042 is presented in Figure 2-3 at the end of this section. As shown in Figure 2-3, chlorobenzene is reacted with chlorine to form tetrachlorobenzene and other polychlorinated benzenes. Tetrachlorobenzene is separated from the product stream and purified via distillation.

The heavy ends or residues from distillation of tetrachlorobenzene are the listed waste K042 and are expected to contain all of the chlorobenzene chlorination by-products. The purified tetrachlorobenzene is then hydrolyzed to form 2,4,5-trichlorophenol. The 2,4,5-trichlorophenol is esterified to form 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).

K085 and K105

Chlorobenzenes are generally produced by both batch and continuous processes by chlorinating benzene in the presence of a Friedel-Crafts catalyst (such as ferric chloride) as illustrated in Figure 2-4. Because higher chlorinated benzenes are also formed as a result of the direct chlorination of benzene, chlorobenzene production is a multi-product operation (i.e., a variety of chlorinated benzenes are produced). Product ratios are influenced by temperature, mole ratios of the feed stocks, residence time, and use of catalysts. In a continuous process, the crude reaction product may be recycled to the process to achieve the desired mixture of final products. In a batch process, the desired product mixture is obtained by adjusting the chlorine concentration and the reaction temperature. Chlorobenzene products are then purified by fractional distillation and/or crystallization.

Continuous chlorination processes are generally used to minimize the quantity of higher chlorinated benzenes produced. The product mixture is separated in a fractionating column, where monochlorobenzene is recovered. The high-boiling bottom products (mostly dichlorobenzenes) are continuously removed to a second fractionating column for recovery of the di- and trichlorobenzenes. The bottoms from the two fractionating columns are the listed waste K085.

Batch processes generally include additional distillation steps to separate the higher chlorinated benzenes. Distillation bottoms from these purification steps are also the listed waste K085.

In batch production of the chlorobenzenes, the chlorobenzene products are washed in an agitated reactor with a 10% sodium hydroxide solution. The resulting separated aqueous layer forms the listed waste K105.

2.1.2 P and U Wastes

P wastes include discarded commercial chemical products, manufacturing chemical intermediates, off-specification commercial chemical products, container residues, and spill residues, including contaminated water, soil, or debris, that are identified as acutely hazardous wastes. U wastes include discarded commercial chemical products, manufacturing chemical intermediates, off-specification commercial chemical products, and spill residues, including contaminated water, soil, or debris, that are identified as toxic wastes. Section 1.0 discusses the definition of U and P wastes in greater detail.

2.1.3 D Wastes

Wastes exhibiting the characteristic of EP Toxicity are listed as D wastes. Waste codes D012, D013, D014, D015, D016, and D017 are included in this document. Many of these wastes are identified as both D and U or P wastes. The EP Toxic constituents are listed below, along with the corresponding U or P waste code, if applicable. Concentrations of the constituents of concern may range from the values listed below to nearly pure product.

Waste Code	Constituent (Concentration in EP Leachate)	Corresponding U or P Waste Code
D012	Endrin (>0.02 mg/l)	P051
D013	Lindane (>0.4 mg/l)	U129
D014	Methoxychlor (>10.0 mg/l)	U247
D015	Toxaphene (>0.5 mg/l)	P123
D016	2,4-D (>10.0 mg/l)	U240
D017	2,4,5-TP (Silvex) (>1.0 mg/l)	--

2.2 Waste Characterization

Tables 2-3 and 2-4 summarize the available characterization data for K032, K033, K034, K041, K042, K085, K097, K098, K105, P020, D014, and D016. The data for the K wastes were obtained from an EPA report (Reference 6). Due to nonspecific waste code listing for U, P, and D wastes and the variability in physical form and composition of the wastes, characterization of these wastes is impractical. The constituents of concern may be present at concentrations varying from several parts per million to nearly 100% in virtually pure product. However, P020, D014, and D016 data were obtained from sampling and analysis conducted by EPA's Office of Solid Waste as part of the Land Disposal Restrictions Program (Reference 7).

2.3 Determination of Waste Treatability Groups

The wastes included in this document were combined into treatability groups based on similarities in elemental composition, functional groups present within the structure of the chemical, and physical and chemical properties known to affect the selection of treatment alternatives and the performance of the technology, such as volatility and bond dissociation energy. The wastes were first divided into three groups based on general chemical structure: (1) Halogenated Pesticides and Chlorobenzenes, (2) Halogenated Phenolics, and (3) Phenolics. Wastes within each group were combined into waste treatability groups as described below. Chemical structures for wastes included in each treatability group are shown in Appendix A.

2.3.1 Halogenated Pesticides and Chlorobenzenes

2.3.1.1 Halogenated Pesticides and Chlorobenzenes - Group 1 (Chlorinated Norbornane and Norbornene Derivatives)

The waste codes included in this group represent compounds that are classified as chlorinated norbornane or norbornene derivatives. These compounds contain two fused or bridged rings, one of which is a six-membered ring. These compounds have common functional groups of single and double carbon-carbon bonds. The compounds in this group also have several substituents attached to their rings, mainly methyl groups and chlorine atoms. Hexachlorocyclopentadiene and kepone, the compounds for which U130 and U142 are listed, are exceptions to this norbornene classification since they do not have a six-membered ring included in their structure. However, their structures are similar to the norbornane and norbornene derivatives and so were included in this group. Based on these similarities in elemental composition and functional groups, the waste codes listed below were grouped together.

K032	Listed for Hexachlorocyclopentadiene
K033	Listed for Hexachlorocyclopentadiene
K034	Listed for Hexachlorocyclopentadiene
K041	Listed for Toxaphene
K097	Listed for Chlordane and Heptachlor
K098	Listed for Toxaphene
D012	Endrin (≥0.02 mg/l in the EP extract)
D015	Toxaphene (≥0.5 mg/l in the EP extract)
P004	Aldrin
P037	Dieldrin
P050	Endosulfan
P051	Endrin and metabolites
P059	Heptachlor
P060	Isodrin
P123	Toxaphene
U036	Chlordane (alpha and gamma isomers)
U130	Hexachlorocyclopentadiene
U142	Kepone

2.3.1.2 Halogenated Pesticides and Chlorobenzenes - Group 2 (Chlorobenzenes)

The waste codes included in this group represent compounds that are classified as chlorinated benzenes. The functional group common to all of the compounds in this group is an aromatic ring. In addition, all of these compounds (with the exception of benzene) have at least one chlorine atom included in their structure. Based on these similarities in elemental composition and functional group, the waste codes listed below were grouped together:

K042	Listed for Hexachlorobenzene and o-Dichlorobenzene
K085	Listed for Benzene, Dichlorobenzenes, Trichlorobenzenes, Tetrachlorobenzenes, Pentachlorobenzene, Hexachlorobenzene, and Benzyl Chloride
K105	Listed for Benzene, Monochlorobenzene, Hexachlorobenzene, and 2,4,5-Trichlorophenol
U037	Chlorobenzene
U070	1,2-Dichlorobenzene
U071	1,3-Dichlorobenzene
U072	1,4-Dichlorobenzene
U127	Hexachlorobenzene
U183	Pentachlorobenzene
U185	Pentachloronitrobenzene
U207	1,2,4,5-Tetrachlorobenzene

2.3.1.3 Halogenated Pesticides and Chlorobenzenes - Group 3 (Chlorophenoxycarboxylic Acids and Derivatives)

The waste codes included in this group represent compounds that are classified as chlorophenoxy carboxylic acids. The functional groups common to all of the compounds in this group are an aromatic ring, a carbon-oxygen-carbon single bond system, a carbon-oxygen double bond, and a carbon-oxygen-hydrogen single bond system. In addition, all of these compounds have at least two chlorine atoms attached to the aromatic ring. Based on these similarities in elemental composition and functional group, the waste codes listed below were grouped together:

D016	2,4-D (≥10.0 mg/l in the EP extract)
D017	2,4,5-TP (Silvex) (≥1.0 mg/l in the EP extract)
U240	2,4-D, salts and esters

2.3.1.4 Halogenated Pesticides and Chlorobenzenes - Group 4 (Chlorinated Diphenyls)

The waste codes included in this group represent compounds that are classified as diphenyls. These compounds consist of two aromatic rings which are singly bonded to a common carbon atom. In addition, all of these compounds have at least one chlorine atom included in their structure. Based on these similarities in elemental composition and functional group, the waste codes listed below were grouped together:

D014	Methoxychlor (≥10.0 mg/l in the EP extract)
U038	Chlorobenzilate
U060	DDD
U061	DDT
U132	Hexachlorophene
U247	Methoxychlor

2.3.1.5 Halogenated Pesticides and Chlorobenzenes - Group 5 (Lindane and Hexachlorobutadiene)

The waste codes included in this group represent compounds that are classified as halogenated aliphatics. These compounds consist of carbon atoms joined by single and double bonds. In addition, these compounds have several chlorine atoms included in their structure. Based on these similarities in elemental composition and functional group, the waste codes listed below were grouped together:

D013	Lindane (≥0.4 mg/l in the EP extract)
U128	Hexachlorobutadiene
U129	Lindane

2.3.2 Halogenated Phenolics

The waste codes included in this group represent compounds that are classified as halogenated phenols. The functional groups common to all of the compounds in this group are an aromatic ring and a carbon oxygen-hydrogen single bond system. In addition, all of these compounds have at least one chlorine atom attached to the aromatic ring. Based on these similarities in elemental composition and functional groups, the waste codes listed below were grouped together:

U039	p-Chloro-m-cresol
U048	2-Chlorophenol
U081	2,4-Dichlorophenol
U082	2,6-Dichlorophenol

2.3.3 Phenolics

The waste codes included in this group represent compounds that are classified as phenols and nitrophenols. The functional groups common to all of the compounds in this group are an aromatic ring and a carbon-oxygen-hydrogen single bond system. The hydroxyl group is attached directly to the aromatic ring. The nitrophenols also have a nitro group (NO_2) attached directly to the ring. Based on these similarities in elemental composition and functional groups, the waste codes listed below were grouped together:

P020	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)
P034	2-Cyclohexyl-4,6-dinitrophenol
P047	4,6-Dinitro-o-cresol, salts
P048	2,4-Dinitrophenol
U052	Cresols (o-, m-, and p- isomers)
U101	2,4-Dimethylphenol

U170	4-Nitrophenol
U188	Phenol
U201	Resorcinol

Table 2-1

NUMBER OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES BY STATE AND EPA REGION

State	EPA Region	Waste Potentially Generated (No. of Facilities)[a]
Alabama	IX	U038 (1), U061 (1), U129 (2), U170 (1), D013 (1)
Alaska	X	U061 (1), U240 (2), D013 (1), D016 (1), D017 (1)
Arizona	IX	D012 (1), D013 (1), D014 (1)
Arkansas	VI	U029 (2), U061 (1), U240 (1), P047 (1), D016 (1)
California	IX	U061 (2), U070 (1), U072 (1), U082 (1), U188 (1), U129 (1), P004 (1), P037 (1), D013 (3), D014 (2), D015 (1), D016 (3), D017 (1)
Delaware	III	K105 (1), U036 (1), U048 (1), U061 (1), U070 (2), U071 (1), U072 (2), U127 (1), U185 (1), U240 (1), U247 (1), P050 (1), D013 (1), D014 (1), D016 (1)
Florida	IV	U082 (1), U142 (2), D013 (1)
Georgia	IV	U061 (2), U129 (1), U170 (1), P050 (1), D013 (1)
Hawaii	IX	U061 (1), U129 (1), U240 (1), P059 (1), D014 (1)
Illinois	V	K032 (1), K033 (1), K034 (1), K097 (2), U036 (1), U037 (1), U052 (1), U070 (1), U072 (1), U130 (1), U240 (4), P037 (1), D012 (1), D014 (2), D015 (1), D016 (2)
Indiana	V	U188 (1)
Iowa	VII	U061 (1), D014 (1), D016 (2)

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (Reference 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-1 (Continued)

NUMBER OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES BY STATE AND EPA REGION

State	EPA Region	Waste Potentially Generated (No. of Facilities)[a]
Kansas	VII	U132 (1), U188 (1)
Kentucky	IV	U070 (1)
Louisiana	VI	U036 (1), U037 (1), U039 (1), U061 (1), U185 (1), U188 (1), U247 (1), D014 (2)
Maine	I	U036 (1)
Massachusetts	I	U247 (1), P050 (1), D012 (1)
Michigan	V	U081 (1), U240 (1), D016 (1)
Minnesota	V	U061 (1), U071 (1), U082 (1), U185 (1), U247 (1), D014 (1)
Mississippi	IV	U129 (2), U247 (1), P020 (1), P050 (1), D016 (1)
Missouri	VII	U036 (1), U037 (1), U061 (2), U072 (1), U129 (1), U183 (1), U185 (1), U240 (1), U247 (1), P004 (1), P037 (1), P050 (1), P051 (1), P059 (1), P123 (1), D013 (1), D014 (1), D015 (1), D016 (1)
Nevada	VII	U061 (1), U072 (1), P123 (1), D013 (1), D015 (1)
New Hampshire	I	D013 (1)
New Jersey	II	K085 (1), U037 (1), U052 (1), U061 (2), U071 (1), U072 (1), U188 (1), P037 (1), P047 (1), P048 (1), D016 (1)

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (Reference 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-1 (Continued)

NUMBER OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES BY STATE AND EPA REGION

State	EPA Region	Waste Potentially Generated (No. of Facilities)[a]
New York	II	U037 (1), U052 (1), U061 (1), U070 (1), U129 (1), U130 (1), U207 (1)
North Carolina	IV	U036 (2), U037 (1), U070 (1), U127 (1), U128 (1), U129 (1), U142 (1), P037 (1), P048 (1), P050 (1), P051 (1), P059 (1), P123 (1), D015 (2), D016 (1)
North Dakota	VIII	U061 (1)
Ohio	V	K085 (1), U037 (1), U061 (1), U071 (1), U072 (1), U185 (1), U188 (1), U240 (2), P037 (1), D012 (2), D013 (1), D014 (1), D016 (3), D017 (1)
Oregon	X	U037 (1), U038 (1)
Pennsylvania	III	U061 (2), U072 (1), U129 (2), U130 (1), U142 (1), U188 (1), U201 (1), U240 (1), P037 (1), D014 (1), D016 (4)
Puerto Rico	II	U037 (1)
South Carolina	IV	U061 (1), U072 (1), U129 (2), U130 (1), U142 (1), U240 (1), P037 (1), D013 (1), D014 (2), D016 (1)
Tennessee	IV	U061 (1), U071 (1), U129 (1), U130 (1), P059 (1), D012 (1)
Texas	VI	U036 (1), U052 (1), U061 (2), U072 (1), U081 (1), U129 (2), U188 (3), U240 (1), D012 (1), D013 (2), D014 (2), D015 (2), D016 (2), D017 (1)
Virginia	III	U036 (1), U129 (1), D014 (1)

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (Reference 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-1 (Continued)

NUMBER OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES BY STATE AND EPA REGION

State	EPA Region	Waste Potentially Generated (No. of Facilities)[a]
Washington	X	U152 (1), U188 (2), U240 (1)
West Virginia	III	K105 (1), U070 (1), U072 (1), U247 (1), P004 (1), D013 (1), D014 (1)
Wisconsin	V	U036 (1), U037 (1), U048 (1), U060 (1), U071 (1), U072 (1), U081 (1), U082 (1), U127 (1), U128 (1), U129 (1), U130 (1), U132 (1), U142 (1), U183 (1), U185 (1), U240 (1), U247 (1), P037 (1), P051 (1), P059 (1), P123 (1), D012 (1), D013 (2), D014 (1), D015 (1), D016 (1), D017 (2)

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (Reference 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-2

NUMBERS OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES

Waste Code	Number of Facilities[a]
D012	8
D013	19
D014	21
D015	9
D016	26
D017	6
K032	1
K033	1
K034	1
K085	2
K097	2
K105	2
P001	1
P004	3
P008	1
P020	1
P037	9
P045	1
P047	2
P048	2
P050	6
P051	3
P057	2
P058	1
P059	5
P066	1
P070	1

Waste Code	Number of Facilities[a]
U037	10
U038	2
U039	1
U041	1
U048	2
U052	5
U053	2
U060	1
U061	26
U066	5
U067	2
U070	8
U071	6
U072	13
U081	3
U082	4
U092	2
U114	1
U116	1
U127	3
U128	2
U129	20
U130	6
U132	2
U142	6
U148	4
U153	1

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (References 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-2 (Continued)

NUMBERS OF FACILITIES THAT MAY GENERATE HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC WASTES

Waste Code	Number of Facilities[a]
P088	1
P102	3
P123	4
U029	2
U036	10
U170	2
U183	2
U188	13
U201	1
U185	6
U207	1
U240	18
U244	2
U247	8
U248	1

[a] Sources: U.S. EPA 1986 TSDR Survey (Reference 3).
1987, 1988 SRI Directory of Chemical Producers, USA (References 4, 5).
Telephone survey conducted in March 1989 by Radian Corporation (see Rulemaking Docket).

Table 2-3

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K032, K033, K034, K041, K042, K085, K097, K098, AND K105

Constituent	Concentration in Untreated Waste (%)[a]								
	K032	K033	K034	K041	K042	K085	K097	K098	K105
BDAT List Constituent									
4. Benzene	--	--	--	--	--	Trace-1	--	--	0.18
9. Chlorobenzene	--	--	--	--	--	0.1-50	--	--	0.008
78. 2-Chlorophenol	--	--	--	--	--	--	--	--	E
87. o-Dichlorobenzene	--	--	--	--	10	--	--	--	0.05
88. p-Dichlorobenzene	--	--	--	--	35	--	--	--	0.05
86-88. Dichlorobenzenes	--	--	--	--	--	1-50	--	--	--
110. Hexachlorobenzene	--	--	--	--	--	E	--	--	--
112. Hexachlorocyclopentadiene	5-75	E	5-25	--	--	--	E	--	--
136. Pentachlorobenzene	--	--	--	--	25	E	--	--	--
142. Phenols	--	--	--	--	--	--	--	--	E
148. Tetrachlorobenzene	--	--	--	--	E	0.01-10	--	--	--
150. Trichlorobenzene	--	--	--	--	20	1-10	--	--	--
151-152. Trichlorophenols	--	--	--	--	--	--	--	--	E
177. Chlordane	E	--	--	--	--	--	E	--	--
186. Heptachlor	E	--	--	--	--	--	E	--	--
191. Toxaphene	--	--	--	1	--	--	--	E	--
200-206. PCBs	--	--	--	--	--	0.01-0.1	--	--	--
Other Constituent									
Camphene	--	--	--	E	--	--	--	E	--
Caustic	--	--	--	--	--	--	--	--	0.4-0.7
Chlorinated hydrocarbons (not otherwise stated)	--	--	--	--	--	--	--	--	0.3-0.8
Chlorobenzophenones	--	--	--	--	--	0.01-0.1	--	--	--
Chlorotoluenes	--	--	--	--	--	E	--	--	--
Diatomaceous earth	--	--	--	E	--	--	--	--	--
Hex filtration media	--	--	50-90	--	--	--	--	--	--
Lime	--	--	--	E	--	--	--	--	--
Other organics	0-10	0-2	--	--	10	--	0-2	--	--
Pinene	--	--	--	E	--	--	--	--	--
-Pinene	--	--	--	--	--	--	--	E	--
Salts	0-10	--	--	--	--	--	--	--	--

[a] Source: U.S. EPA. Characterization of Waste Streams Listed in 40 CFR Section 261 (Reference 6).

-- Not analyzed for this constituent.

E Expected to be present in the waste; however, no quantitative data are available.

Table 2-3 (Continued)

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K032, K033, K034, K041, K042, K085, K097, K098, AND K105

	Concentration in Untreated Waste (%)[a]								
Constituent	K032	K033	K034	K041	K042	K085	K097	K098	K105
Other Constituent (Cont.)									
Sodium chloride	--	0-20	--	--	--	--	0-20	--	15-20
Sodium hydroxide	--	0-20	--	--	--	--	0-20	--	--
Sodium hypochlorite	0-15	0-20	--	--	--	--	0-20	--	--
Water	25-90	50-95	--	E	--	--	50-95	E	78.5-99.712
Other Parameters									
Ash Content (%)	0-25	0-20	0-21	--	--	--	0-20	--	--
Heating Value (kJ/kg)	<6,978	--	<11,630	100	10,600	--	--	--	--
pH	8-13	>12.5	--	--	--	--	>12.5	--	11
Specific Gravity	1.3-1.6	1.0-1.2	0.6-0.7	--	1.6	1.2-1.3	1.0-1.2	--	1.12-1.15 @20°C
Total Organic Carbon (%)	10-40	<1	80-100	--	32	27-57	<1	--	Approx. 0.27
Total Organic Halogen (%)	0-30	<1	0-20	--	60	40-46	<1	--	Approx. 0.27
Viscosity (mPa-s)	--	0.9-1.1	--	--	--	14,000-23,500	0.9-1.1	--	--

[a] Source: U.S. EPA. Characterization of Waste Streams Listed in 40 CFR Section 261 (Reference 6).

-- Not analyzed for this constituent.

E Expected to be present in the waste; however, no quantitative data are available.

Table 2-4

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR P020, D014, AND D016

BDAT List Constituent	Concentration in Untreated Waste (ppm)[a]			
	P020	D014	D016-1[b]	D016-2[b]
Volatile Organics				
222. Acetone	0.012	0.13	0.057	3.3
7. Carbon tetrachloride	ND	ND	ND	0.01
8. Carbon disulfide	ND	ND	ND	0.059
43. Toluene	ND	9	ND	ND
215-217. Xylenes (total)	ND	ND	ND	0.011
Semivolatile Organics				
70. Bis(2-ethylhexyl)phthalate	ND	ND	19.8	ND
73. 2-sec-Butyl-4,6-dinitrophenol	206	ND	ND	ND
92. Diethyl phthalate	ND	4.05	ND	ND
Metals				
154. Antimony	12	4.5	16	12
155. Arsenic	73	6.1	ND	5.4
156. Barium	102	11	203	29
157. Beryllium	0.47	ND	0.36	0.12
158. Cadmium	1.0	ND	1.2	0.88
159. Chromium, total	12	5.1	237	25
160. Copper	10	2.1	30	383
161. Lead	27	1.3	11	3.1

[a] Source: U.S. EPA. Final Characterization Report for Cedar Chemical, Velsicol Chemical Corp., A.H. Robins, and O.M. Scott and Sons. 1989. (Reference 7).

[b] Two types of D016 wastes were sampled at O.M. Scott and Sons as described in Reference 7.

ND - Not detected.

Table 2-4 (Continued)

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR P020, D014, AND D016

BDAT List Constituent	Concentration in Untreated Waste (ppm)[a]			
	P020	D014	D016-1[b]	D016-2[b]
Metals (Cont.)				
162. Mercury	0.76	ND	0.17	1.8
163. Nickel	10	1.7	65	11
167. Vanadium	13	8.0	41	8.4
168. Zinc	33	5.3	102	494
EP Toxicity Metals				
155. Arsenic	0.08	ND	0.061	0.04
156. Barium	0.473	0.068	0.06	0.073
158. Cadmium	0.0074	ND	0.017	ND
159. Chromium, total	0.01	0.0081	0.028	0.013
162. Mercury	ND	ND	0.0025	ND
Inorganics				
169. Cyanide	0.85	ND	ND	1.26
170. Fluoride	ND	3.45	23.1	57.1
171. Sulfide	ND	39.7	6.1	213
* Calcium	26,500	856	1,750	1,590
* Magnesium	9,410	391	21,600	1,910
* Potassium	564	3,220	32,800	4,270
* Sodium	217	98,400	1,120	1,180

[a] Source: U.S. EPA. Final Characterization Report for Cedar Chemical, Velsicol Chemical Corp., A.H. Robins, and O.M. Scott and Sons. 1989. (Reference 7).

[b] Two types of D016 wastes were sampled at O.M. Scott and Sons as described in Reference 7.

ND - Not detected.

* Not a BDAT list constituent.

Table 2-4 (Continued)

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR P020, D014, AND D016

BDAT List Constituent	Concentration in Untreated Waste (ppm)[a]			
	P020	D014	D016-1[b]	D016-2[b]
Organochlorine Pesticides				
190. Methoxychlor	ND	1,800	ND	ND
Phenoxyacetic Acid Herbicides				
192. 2,4-Dichlorophenoxyacetic acid	ND	ND	17,000	23,000
Other Parameters				
Heating Value (Btu/lb)	18	1,438	3,251	3,578
Ash Content (%)	81.4	62.2	29.1	14.6
Moisture Content** (%)	12.4	4.0	18.7	56.5
Total Solids (%)	87.8	96.0	81.3	43.5
Total Organic Carbon (%)	0.431	4.52	16.4	11.1
Total Halogens (%)	0.145	0.0165	2.46	0.526
Carbon (%)	3.03	12.3	16.6	15.6
Hydrogen (%)	1.46	1.14	4.26	8.17
Nitrogen (%)	0.477	2.26	26.2	8.25
Oxygen (%)	12.8	19.7	20.3	51.5
Sulfur (%)	0.00432	0.0764	0.372	0.502

[a] Source: U.S. EPA. Final Characterization Report for Cedar Chemical, Velsicol Chemical Corp., A.H. Robins, and O.M. Scott and Sons. 1989. (Reference 7).

[b] Two types of D016 wastes were sampled at O.M. Scott and Sons as described in Reference 7.

NA - Not analyzed.
ND - Not detected.

** The weight loss of air-dried samples is used to determine the moisture content of the samples. However, some of the weight loss may be due to the volatile organics present in the samples (notably, the heptachlor sample). Thus, the results for moisture content may be biased high.

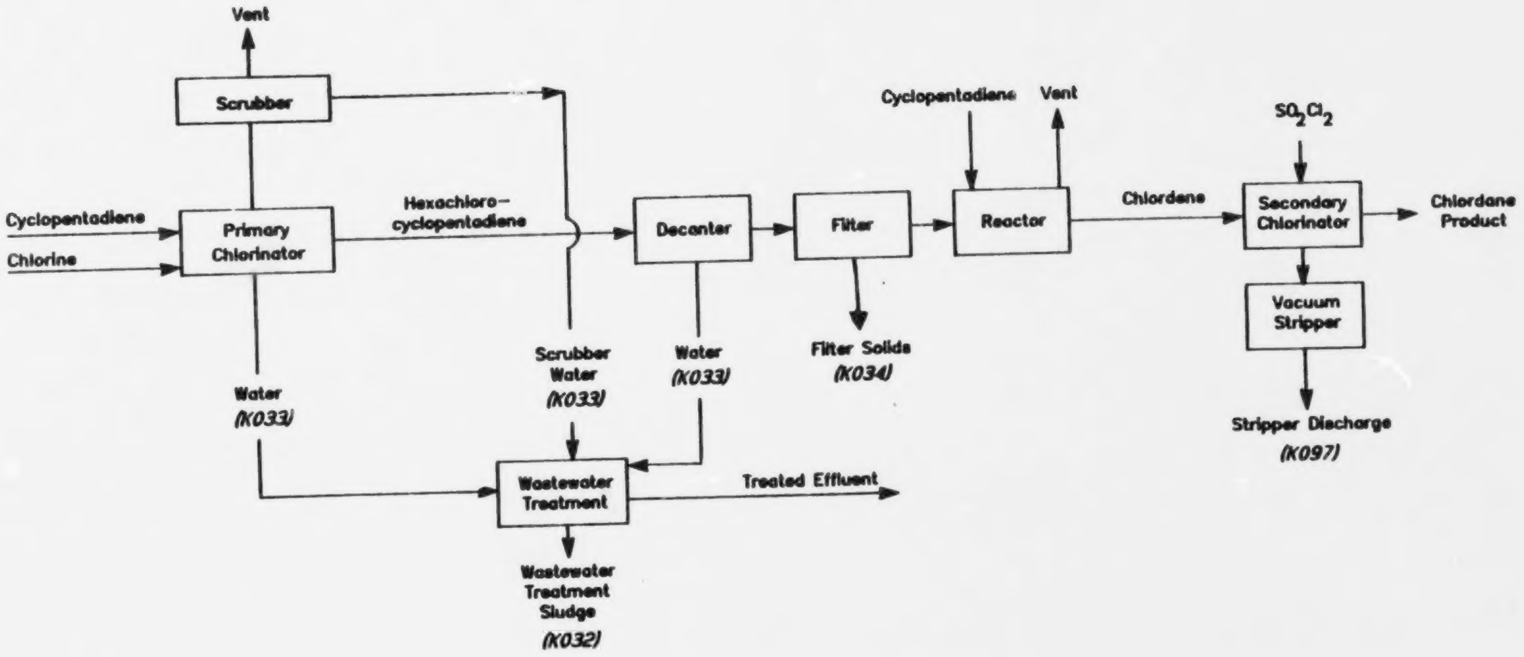
Vent
Scrubber
Cyclopentadiene
Chlorine
Primary Chlorinator
Hexachloro-cyclopentadiene
Water (K033)
Scrubber Water (K033)
Decanter
Water (K033)
Filter
Filter Solids (K034)
Cyclopentadiene
Vent
Reactor
Chlordane
SO2Cl2
Secondary Chlorinator
Chlordane Product
Vacuum Stripper
Stripper Discharge (K097)
Wastewater Treatment
Treated Effluent
Wastewater Treatment Sludge (K032)

Figure 2–1. Chlordane Manufacturing Process

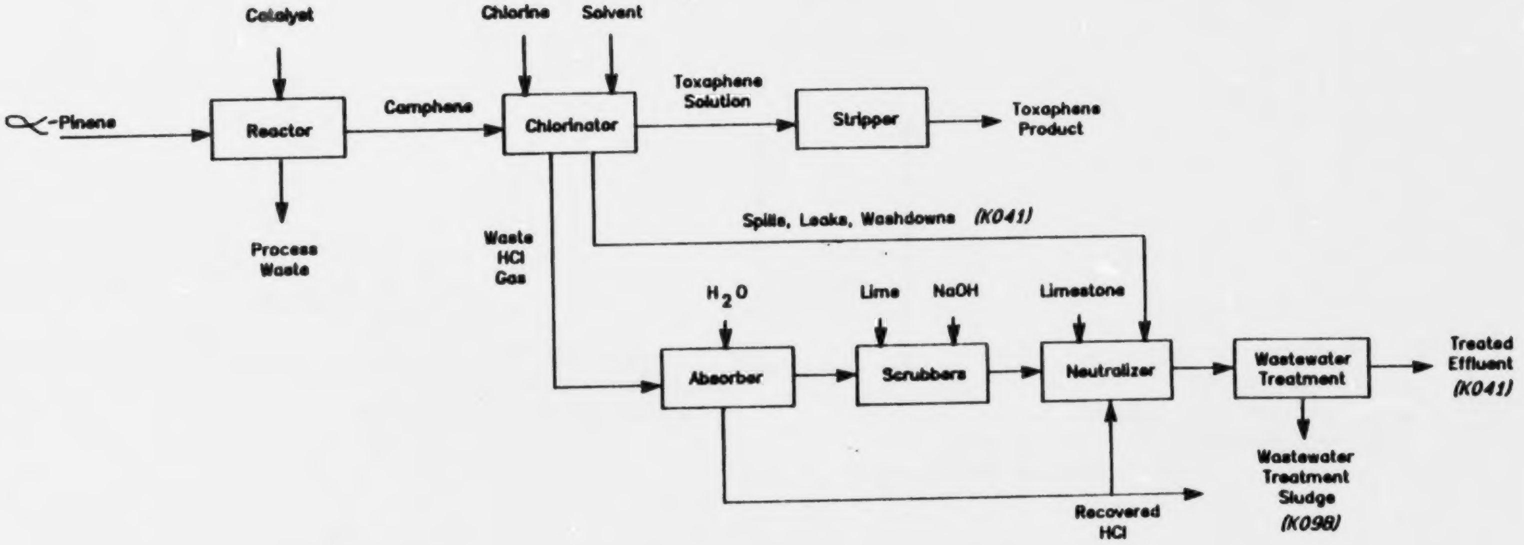
α-Pinene
Catalyst
Reactor
Process Waste
Camphene
Chlorine
Solvent
Chlorinator
Toxaphene Solution
Stripper
Toxaphene Product
Spills, Leaks, Washdowns (K041)
Waste HCl Gas
H2O
Absorber
Lime
NaOH
Scrubbers
Limestone
Neutralizer
Recovered HCl
Wastewater Treatment
Wastewater Treatment Sludge (K098)
Treated Effluent (K041)

Figure 2-2. Toxaphene Manufacturing Process

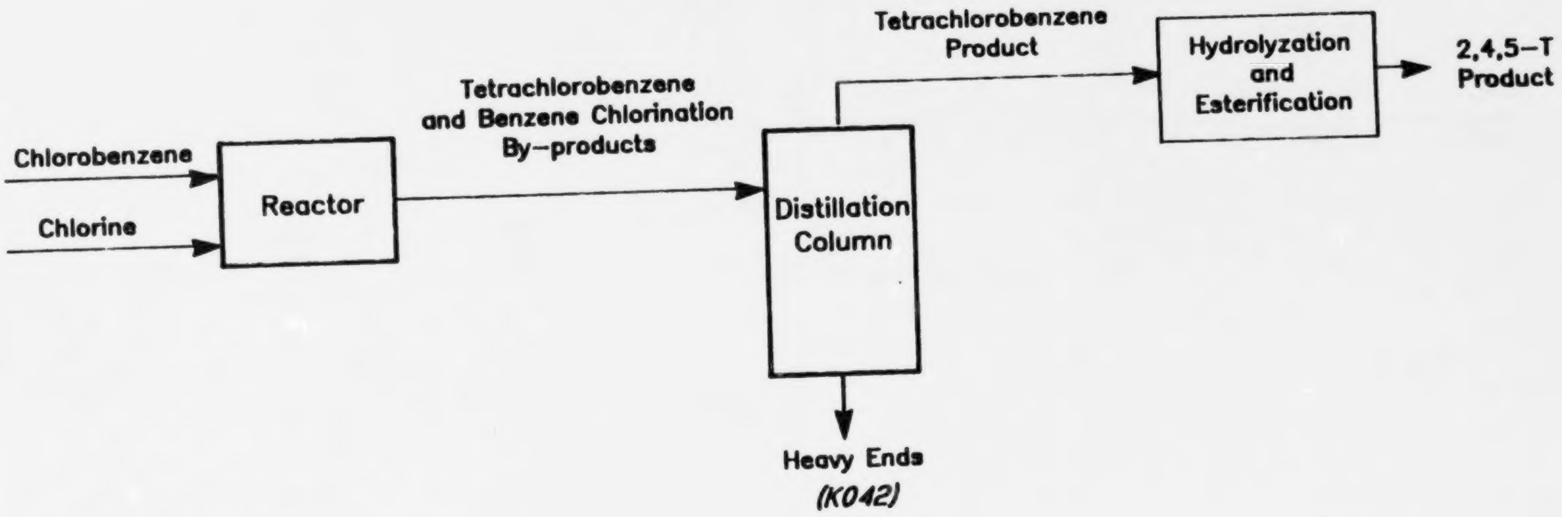
Chlorobenzene
Chlorine
Reactor
Tetrachlorobenzene and Benzene Chlorination By-products
Distillation Column
Heavy Ends
(K042)
Tetrachlorobenzene Product
Hydrolyzation and Esterification
2,4,5-T Product

Figure 2-3. 2,4,5-T Manufacturing Process

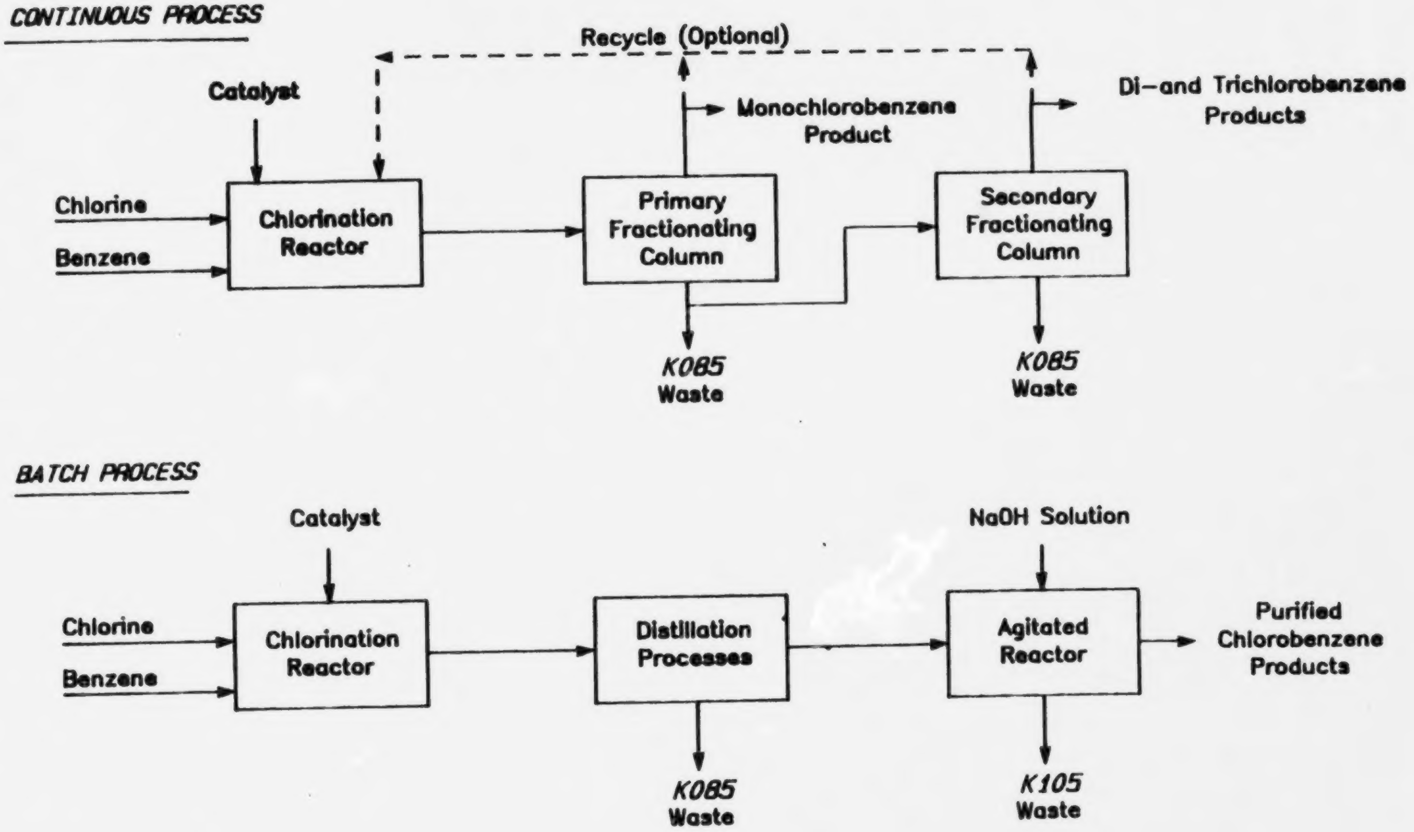
CONTINUOUS PROCESS
Recycle (Optional)
Catalyst
Monochlorobenzene Product
Di-and Trichlorobenzene Products
Chlorine
Benzene
Chlorination Reactor
Primary Fractionating Column
Secondary Fractionating Column
K085 Waste
K085 Waste
BATCH PROCESS
Catalyst
NaOH Solution
Chlorine
Benzene
Chlorination Reactor
Distillation Processes
Agitated Reactor
Purified Chlorobenzene Products
K085 Waste
K105 Waste

Figure 2–4. Chlorobenzenes Manufacturing Processes

3.0 IDENTIFICATION OF BEST DEMONSTRATED AND AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining the best demonstrated available technology (BDAT) for halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic wastes. Proposed BDAT is incineration for nonwastewater and wastewater forms of all these wastes. In addition to incineration, proposed BDAT for P034 wastewaters and salts of P047 wastewaters is wet air oxidation followed by carbon absorption, chemical oxidation followed by carbon adsorption, and biological treatment followed by activated carbon. In addition to incineration, BDAT for salts and esters of U240 wastewaters is wet air oxidation followed by carbon adsorption, chemical oxidation followed by carbon adsorption, and incineration.

Alternate concentration-based treatment standards for all U and P wastewaters have also been developed based on additional wastewater treatment data from several technologies. These data and the corresponding treatment technologies are discussed in Reference 9 and are included in Sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble.

This section presents the Agency's determination of:

- applicable technologies;
- demonstrated technologies;
- available technologies; and
- the best technology for treatment of these wastes.

In determining BDAT, the Agency first determines which technologies are potentially applicable for treatment of the waste(s) of interest. The Agency then determines which of the applicable technologies are demonstrated for treatment of the waste(s) of interest, and of those demonstrated technologies, which are considered to be available for treatment of the waste(s) of interest.

All of the wastes included in this document are organic. Therefore, the treatment technologies identified in this section are for treatment of hazardous organic constituents. Some of the wastes may contain metals at treatable concentrations as a result of the manner in which the waste was generated; however, the Agency is not identifying applicable, demonstrated, and available technologies for treatment of metals at this time.

An available treatment technology is one that (1) is not a proprietary or patented process that cannot be purchased or licensed from the proprietor (i.e., it must be commercially available), and (2) substantially diminishes the toxicity of the waste or substantially reduces the likelihood of migration of hazardous constituents from the waste.

3.1 Applicable Treatment Technologies

To be applicable, a technology must theoretically be usable to treat the waste in question or to treat a waste similar in terms of parameters that affect treatment selection. (Detailed descriptions of technologies that are applicable to listed hazardous wastes are provided in EPA's Treatment Technology Background Document (Reference 8)).

The following subsections present applicable treatment technologies for halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic nonwastewaters and wastewaters.

3.1.1 Nonwastewaters

Since nonwastewater forms of these wastes may contain hazardous organic constituents at treatable concentrations as discussed in Section 2.2, applicable treatment technologies include those that destroy or reduce the total amount of various organic compounds in the waste. The Agency has identified the following treatment technologies as applicable for these wastes:

- Incineration (fluidized bed, rotary kiln, and liquid injection);
- Solvent extraction followed by incineration or recycle of the extract;
- Critical fluid extraction followed by incineration of the contaminated solvents; and
- Wet air oxidation.

Total recycle or reuse may also be applicable for certain wastes such as off-specification commercial chemical products. These treatment technologies were identified based on current waste treatment practices and engineering judgment.

Many of the wastes that are the subject of this background document may be generated in a variety of forms, and application of treatment technologies depends upon the physical form of the waste. For example, a contaminated soil may be amenable to rotary kiln incineration, while an off-specification liquid chemical product may be amenable to liquid injection incineration.

Incineration. Incineration is a destruction technology in which energy, as heat, is transferred to the waste to destabilize chemical bonds and destroy hazardous organic constituents. In a fluidized bed incinerator, waste is injected into the fluidized bed material (generally sand and/or incinerator ash), where it is heated to its ignition temperature. Heat energy from the combustion reactions is then transferred back to the fluidized bed. Ash is removed periodically during operation and during bed change-outs.

In a rotary kiln incinerator, wastes are fed into the elevated end of the kiln, and the rotation of the kiln mixes the waste with hot gases to heat the waste to its ignition temperature. Ash is removed from the lower end of the kiln. Combustion gases from the kiln enter the afterburner for complete destruction of waste constituents. Other wastes may also be injected into the afterburner.

In a liquid injection incinerator, liquid wastes are atomized and injected into the incinerator. In general, only wastes with low or negligible ash content are amenable to liquid injection incineration. Therefore, this technology generally does not generate an ash residual.

Combustion gases from the incinerator are then fed to a scrubber system for cooling and removal of entrained particulates and acid gases, if present. In general, with the exception of liquid injection incineration, two residuals are generated by incineration processes: ash and scrubber water.

Solvent Extraction. Solvent extraction is a separation technology in which organics are removed from the waste due to greater constituent solubility in the solvent phase than in the waste phase. This technology generates two residuals: a treated waste residual and an extract. The extract may be recycled or treated by incineration.

Critical Fluid Extraction. Critical fluid extraction is a solvent extraction technology in which the solvent is brought to its critical state (liquid gas) to aid in the extraction of hazardous organic constituents from the wastes. After the extraction step, the solvent is returned to its normal gaseous state, generating a small volume of extract that is concentrated in hazardous organic constituents. This technology generates two residuals: a treated waste residual and an extract. The extract may be recycled or treated by incineration.

Wet Air Oxidation. Wet air oxidation is a destruction technology in which hazardous organic constituents in wastes are oxidized and destroyed under pressure at elevated temperatures in the presence of dissolved oxygen. This technology is applicable for wastes comprised primarily of water and up to 10% total organic constituents. Wet air oxidation generates one treatment residual: treated effluent. The treated effluent may require further treatment for hazardous organic constituents by carbon adsorption or PACT^R treatment (these technologies are described in Section 3.1.2). Emissions from wet air oxidation may require further treatment by incineration.

Total Recycle or Reuse. Total recycle or reuse of a waste in the same process or another process eliminates the generation of the waste and consequently generates no treatment residuals.

3.1.2 Wastewaters

Since wastewater forms of these wastes contain hazardous organic constituents at treatable concentrations, applicable technologies include those that destroy or reduce the total amount of various organic compounds in the waste. Therefore, the Agency has identified the following treatment technologies as potentially applicable for treatment of these wastes:

- Incineration;
- Wet air oxidation;
- PACT^R treatment;
- Biological treatment;
- Carbon adsorption; and
- Solvent extraction and chemical oxidation.

Total recycle or reuse may also be applicable for certain wastewaters. These treatment technologies were identified based on current waste treatment practices and engineering judgment.

The concentrations and type(s) of waste constituents present in the waste generally determine which technology is most applicable. Carbon adsorption, for example, is often used as a polishing step following primary treatment by biological treatment, solvent extraction, or wet air oxidation. Typically, carbon adsorption is applicable for treatment of wastewaters containing less than 0.1% total organic constituents. Wet air oxidation, PACT^R treatment, biological treatment, and solvent extraction are applicable for treatment of wastewaters containing up to 1% total organic constituents. Many of these wastewaters that are the subject of this document may contain constituents that are too toxic to biomass and therefore cannot be treated effectively by biological treatment or PACT^R treatment.

Incineration. Incineration of wastewaters is identical to that of nonwastewaters described previously in Section 3.1.1.

Wet Air Oxidation. Wet air oxidation of wastewaters is identical to that of nonwastewaters described previously in Section 3.1.1.

PACT^R Treatment. PACT^R treatment is a combination of carbon adsorption and biological treatment in which hazardous organic constituents are biodegraded or selectively adsorbed onto powdered-activated carbon. This technology generates two treatment residuals: a treated effluent and spent carbon/biosludge. The spent carbon may be regenerated and recycled to the process or may be incinerated.

Biological Treatment. Biological treatment is a destruction technology in which hazardous organic constituents in wastewaters are biodegraded. This technology generates two treatment residuals: a treated effluent and a waste biosludge. Waste biosludge may be land disposed without further treatment if it is less than or equal to the BDAT treatment standards. The Agency believes that halogenated organic wastes may not be amenable to biological treatment. However, the Agency is soliciting comments as to whether biological treatment is applicable for treatment of salts and esters of 2,4-dichlorophenoxyacetic acid.

Carbon Adsorption. Carbon adsorption is a separation technology in which hazardous organic constituents in wastewaters are selectively adsorbed onto activated carbon. This technology generates two treatment residuals: a treated effluent and spent activated carbon. The spent activated carbon can be reactivated and recycled.

Solvent Extraction. Solvent extraction of wastewaters is identical to that of nonwastewaters described previously in Section 3.1.1.

Chemical Oxidation. Chemical oxidation is a destruction technology in which inorganic cyanides, some dissolved organic compounds, and sulfides are chemically oxidized to yield carbon dioxide, water, salts, simple organic acids, and, in the case of sulfides, sulfates. This technology generates one treatment residual: treated effluent.

Total Recycle or Reuse. Total recycle or reuse of wastewaters is identical to that of nonwastewaters described previously in Section 3.1.1.

3.2 Demonstrated Treatment Technologies

To be demonstrated, a technology must be employed in full-scale operation for treatment of the waste in question or a similar waste. Technologies available only at pilot- or bench-scale operations are not considered in identifying demonstrated technologies.

The following subsections present demonstrated treatment technologies for halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic nonwastewaters and wastewaters.

3.2.1 Nonwastewaters

The Agency has identified incineration as a demonstrated technology for treatment of nonwastewater forms of these wastes. Incineration is demonstrated on a full-scale operational basis for treatment of several of these nonwastewaters as determined from telephone contacts with pesticide manufacturers, formulators, packagers, and chemical manufacturers. For the land disposal restrictions program, the Agency tested rotary kiln incineration on a full-scale operational basis for treatment of the following waste constituents in each treatability group, as described in Section 4.0:

Halogenated Pesticides and Chlorobenzenes - Group 1

Hexachlorocyclopentadiene
Chlordane
Heptachlor

Halogenated Pesticides and Chlorobenzenes - Group 2

Chlorobenzene
1,2-Dichlorobenzene
1,4-Dichlorobenzene
Hexachlorobenzene
Pentachlorobenzene
Pentachloronitrobenzene
1,2,4,5-Tetrachlorobenzene

Halogenated Pesticides and Chlorobenzenes - Group 3

2,4-Dichlorophenoxyacetic acid

Halogenated Pesticides and Chlorobenzenes - Group 4

Methoxychlor

Halogenated Pesticides and Chlorobenzenes - Group 5

Hexachlorobutadiene

Halogenated Phenolics

2,4-Dichlorophenol
2,6-Dichlorophenol

Phenolics

2-sec-Butyl-4,6-dinitrophenol
o-Cresol
p-Cresol
Phenol

The Agency believes that since incineration is demonstrated for treatment of these waste constituents, incineration is also demonstrated for all of the wastes included in each treatability group based on similarities in chemical and physical properties as discussed in Section 2.3.

The Agency is not aware of any facilities that treat nonwastewater forms of these wastes or wastes judged to be similar on a full-scale operational basis using solvent extraction, critical fluid extraction, or wet air oxidation; therefore, EPA believes that these technologies are not currently demonstrated for these wastes.

Total recycle or reuse is demonstrated for treatment of several off-specification pesticides nonwastewaters as determined from telephone contacts with pesticide manufacturers, formulators, and packagers.

3.2.2 Wastewaters

Additional wastewater treatment performance data, primarily from the Agency's Office of Water, have been recently analyzed for the U and P wastes included in this document. These data are for treatment of wastewaters that are not specifically listed as U and P wastewaters, but contain many of the corresponding U and P waste constituents. While these data were not available in time for incorporation into this background document, these data are included in the Wastewater Background Document (Reference 3). The following technologies have been identified as demonstrated for treatment of U and P waste constituents in each treatability group:

Halogenated Pesticides and Chlorobenzenes - Group 1

Biological Treatment
Granular Activated Carbon
Chemical Reduction
Wet Air Oxidation

Halogenated Pesticides and Chlorobenzenes - Group 2

Biological Treatment
Air Stripping
Granular Activated Carbon
PACT
Reverse Osmosis
Steam Stripping
Wet Air Oxidation

Halogenated Pesticides and Chlorobenzenes - Group 3

Biological Treatment
Chemical Oxidation

Halogenated Pesticides and Chlorobenzenes - Group 4

Biological Treatment
Wet Air Oxidation

Halogenated Pesticides and Chlorobenzenes - Group 5

Biological Treatment
Granular Activated Carbon
PACT

Halogenated Phenolics

Biological Treatment
Granular Activated Carbon
PACT
Wet Air Oxidation
Super Critical Oxidation

Phenolics

Wet Air Oxidation
Activated Carbon
PACT
Biological Treatment
Chemical Oxidation
Chemical Reduction
Solvent Extraction
Steam Stripping

Based on the technologies listed above, and technologies identified for other similar organic constituents, the Agency considers the following technologies to be demonstrated for wastewater forms of the U and P wastes included in this document:

- Wet air oxidation followed by carbon adsorption;
- Chemical oxidation followed by carbon adsorption; and
- Biological treatment followed by carbon adsorption.

The Agency is not aware of any facilities that incinerate wastewater forms of the wastes included in this document. However, commenters to the Second Third proposed rule indicated that they were indeed incinerating many wastewaters and that they did not want to be precluded from doing so. Since incineration is demonstrated for treatment of waste constituents in nonwastewater forms of these wastes as discussed in Section 3.2.1, the Agency believes incineration is also demonstrated for these waste constituents in wastewater forms of these wastes. Therefore, the Agency is also identifying incineration as a demonstrated technology for wastewaters.

The Agency is aware of several facilities that recycle and reuse many for off-specification U and P wastes. Therefore, recycle and reuse is considered to be demonstrated for these wastes.

3.3 Available Treatment Technologies

An available treatment technology is one that (1) is not a proprietary or patented process that cannot be purchased or licensed from the proprietor (i.e., it must be commercially available), and (2) substantially diminishes the toxicity of the waste or substantially reduces the likelihood of migration of hazardous constituents from the waste.

The demonstrated technologies identified in Section 3.2 are all commercially available. Treatment performance data included in Section 4.0 show substantial treatment by incineration for waste constituents of concern and other similar constituents. Treatment performance data included in the Wastewater Background Document (Reference 3) show substantial treatment by wet air oxidation, carbon adsorption, biological treatment, and chemical oxidation. Therefore, these technologies are "available" for treatment of the wastes included in this document.

3.4 Identification of BDAT

For a treatment technology to be identified as BDAT, the treatment performance data are first screened to determine:

- Whether the data represent operation of a well-designed and well-operated treatment system;
- Whether sufficient analytical quality assurance/quality control measures were employed to ensure the accuracy of the data; and
- Whether the appropriate measure of performance was used to assess the performance of the particular treatment technology.

With the exceptions of tests 13 and 14, all of the incineration data included in Section 4.0 represent BDAT for wastes in previous rulemakings and therefore meet the above conditions. Treatment performance data and design and operating data for tests 13 and 14 are included in Section 4.0. The treatment system was well-designed and well-operated and sufficient analytical quality assurance/quality control measures were employed. The appropriate measure of performance (total constituent concentration) was used to assess the treatment system. Therefore, incineration is proposed BDAT for nonwastewater and wastewater forms of these wastes for each treatability group.

In cases where the Agency has treatment performance data for both wastewater treatment processes as well as data on incineration as measured by constituent concentrations in scrubber water, the Agency prefers to establish treatment standards based on the wastewater treatment processes. Since treatment performance data from wastewater treatment processes were not available in time to incorporate into this background document to develop numerical treatment standards for wastewaters, incineration is proposed BDAT for wastewater forms of these wastes. However, since the Agency is specifying a treatment method as the BDAT treatment standard for P034, salts of P047, and salts and esters of U240 as discussed in Section 6.0, the Agency considered the technologies identified as demonstrated and available for treatment of wastewaters. Therefore, in addition to incineration, proposed BDAT for P034 wastewaters, salts of P047 wastewaters, and salts and esters of U240 wastewaters is wet air oxidation followed by carbon adsorption and chemical oxidation followed by carbon adsorption. Biological treatment followed by carbon adsorption is also proposed BDAT for P034 wastewaters and salts of P047 wastewaters. Biological treatment followed by carbon adsorption is not identified as proposed BDAT for salts and esters of U240 wastewaters, since the Agency believes that this waste is not amenable to biological treatment.

4.0 TREATMENT PERFORMANCE DATA BASE

This section presents the data available to EPA on the performance of treatment technologies that are demonstrated for wastes in the halogenated pesticides and chlorobenzenes, halogenated phenolics, and phenolics treatability groups. Section 2.3 summarized the specific waste codes included in each treatability group. Wastewater treatment data from EPA's Office of Water and EPA-conducted wastewater treatment tests were not available in time for incorporation into this document; these data are included in the Wastewater Background Document (Reference 3) and in the administrative record for this rulemaking as discussed in Section 1.2.

The available treatment performance data are used elsewhere in this document to determine which technologies represent BDAT (Section 3.0), to select constituents for proposed regulation (Section 5.0), and to develop proposed treatment standards (Section 6.0). In addition to using treatment performance data from full-scale operations, eligible data may include those developed at research facilities or obtained at less than full-scale operations, provided that the technology is demonstrated in full-scale operation for a similar waste or wastes (as described in Section 3.0).

Treatment performance data, to the extent that they are available to EPA, include the concentrations for a given constituent in the untreated and treated waste, values of operating parameters measured at the time the waste was treated, and values of relevant design parameters for the treatment technology.

Where data are not available on the treatment of the specific waste of concern, the Agency may elect to transfer performance data from the treatment of a similar waste or wastes, using a demonstrated treatment technology. EPA's methodology for the transfer of treatment performance data is provided in EPA's Methodology for Developing BDAT Treatment Standards (Reference 2). Transfer of treatment performance data is technically valid in cases where the untested wastes are generated from similar industries or similar processing steps, or have waste characteristics affecting treatment selection and performance that are similar to those of the tested wastes.

In an effort to account for the wide range of physical forms for U, P, and D wastes, EPA examined all available BDAT incineration data to develop treatment standards. Specifically, the Agency considered treatment performance data from 14 incineration tests listed in Table 4-1 at the end of this section. Plant codes cited in Table 4-1 are included in Appendix B. In cases where an individual waste constituent of concern was detected in the untreated or treated wastes from one or more treatment tests, data from only those tests were used to develop treatment standards for that constituent. In cases where an individual waste constituent of concern was not detected in any of the untreated or treated wastes from the 14 treatment tests, detection limits achieved for that constituent in ash and scrubber water residuals from all the tests were used to develop treatment standards as discussed in Section

6.0. Only treatment performance data for the U, P, and D waste constituents of interest from the 14 treatment tests are presented in this section. Values of design and operating parameters for each treatment test can be found in the corresponding Onsite Engineering Report for each test (References 10 through 23).

The following subsections present and discuss the treatment performance data that were used to develop proposed treatment standards for each waste treatability group.

4.1 Halogenated Pesticides and Chlorobenzenes

4.1.1 Group 1 - Chlorinated Norbornane and Norbornene Derivatives

The Agency does not have performance data for treatment of K032, K033, K034, K041, K097, and K098 nonwastewaters or wastewaters. Therefore, treatment performance data were transferred from other tested wastes to develop treatment standards for these wastes. Sources of treatment performance data for potential transfer to K032, K033, K034, K041, K097, and K098 nonwastewaters and wastewaters include wastes previously tested by incineration. (This technology was identified as applicable and demonstrated for treatment of these wastes in Section 3.0.) Wastes previously tested by the Agency by incineration are listed in Table 4-1. EPA examined these wastes to identify the best data source(s), if any, for transfer of treatment performance data to K032, K033, K034, K041, K097, and K098 nonwastewaters and wastewaters. Specifically, EPA examined whether the untested wastes are (1) generated from similar industries or processing steps and (2) whether the wastes have similar waste characteristics affecting treatment performance as these previously-tested wastes.

K032, K033, K034, K041, K097, and K098 are generated by the pesticides industry. The wastes treated by rotary kiln incineration in test 13 (see Table 4-1) are also generated by the pesticides industry. As discussed in the Treatment Technologies Background Document (Reference 8), waste characteristics that affect treatment performance for rotary kiln incineration include the thermal conductivity of the waste and the boiling points and bond dissociation energies of the constituents of concern. Because the K wastes of interest contain many of the same waste constituents as the wastes included in test 13, they would have similar thermal conductivity, boiling points, and bond dissociation energies, and similar treatment performance could be achieved.

Based on the similarities discussed above, treatment performance data from test 13 were transferred to K032, K033, K034, K041, K097, and K098. Treatment performance data for tests 13 and 14 are included in Tables 4-2 through 4-5. Wastes treated at test 13 include a blend of D014, D016, commercial chemical products as surrogates for U127 and U192, a heptachlor process waste as a surrogate for P059, and clean fill soil. Wastes treated at test 14 include a blend of commercial chemical products as surrogates for U141, U028, P020, U112, U226, U239, U080, U220, U166, U161, and U188. Table 4-2 presents the BDAT List constituents detected in the untreated waste feed blends for tests 13 and 14. Table 4-3 presents the BDAT List constituents detected in the kiln ash residual from tests 13 and 14, and Table 4-4 presents the BDAT List constituents detected in the scrubber water residual from tests 13 and 14. Design and operating data for the rotary kiln and secondary combustor from tests 13 and 14 are presented in Table 4-5. All tables are presented at the end of this section. Additional details of tests 13 and 14 may be found in the Onsite Engineering Report for the Third Thirds Incineration Treatment Test (Reference 23).

The U, P, and D wastes included in this treatability group are D012, D015, P004, P037, P050, P051, P059, P060, P123, U036, U130, and U142. Table 4-6 includes the constituent concentrations for untreated waste, ash, and scrubber water for waste constituents that were detected in at least one of the 14 tests listed in Table 4-1. Table 4-7 presents the waste constituents that were not detected in any of the 14 tests and the highest detection limits for those waste constituents in ash and scrubber water in each test.

4.1.2 Group 2 - Chlorobenzenes

The Agency does not have performance data for treatment of K042, K085, and K105 nonwastewaters or wastewaters. Therefore, treatment performance data were transferred from other tested wastes to develop treatment standards for these K wastes. Sources of treatment performance data for potential transfer to K042, K085, and K105 nonwastewaters and wastewaters include wastes previously tested by incineration. (This technology was identified as applicable and demonstrated for treatment of these wastes in Section 3.0.) Wastes previously tested by the Agency by incineration are listed in Table 4-1. EPA examined these wastes to identify the best data source(s), if any, for transfer of treatment performance data to K042, K085, and K105 nonwastewaters and wastewaters. Specifically, EPA examined whether the untested wastes are (1) generated from similar industries or processing steps and (2) whether the wastes have similar waste characteristics affecting treatment performance as these previously-tested wastes.

K085 and K105 are generated by the chlorinated organic chemicals industry, while K042 is generated by the pesticides industry. The wastes treated by rotary kiln incineration in tests 4 and 11 (see Table 4-1) are generated by the chlorinated organic chemicals industry. The wastes treated by rotary kiln incineration in test 13 (see Table 4-1) are generated by both the chlorinated organic chemicals and the pesticides industries. Similar to K042, K085, and K105, the wastes included in tests 4 and 11 are generated by a separation process from the product stream, such as distillation or filtration. Unlike the K wastes of interest, however, the wastes from tests 4 and 11 are generated from the production of, and are mainly composed of, chlorinated aliphatic compounds; K042, K085, and K105 are generated from the production of, and are mainly composed of, chlorinated aromatic compounds.

As discussed in the Treatment Technologies Background Document (Reference 8), waste characteristics that affect treatment performance for rotary kiln incineration include the thermal conductivity of the waste and the boiling points and bond dissociation energies of the constituents of concern. The constituents comprising K042, K085, and K105 are mainly chlorinated aromatic compounds, which, based on structural stability, would be more difficult to treat than the aliphatic compounds comprising the wastes from tests 4 and 11. The constituents comprising K042, K085, and K105 are most structurally similar to those treated in test 13 and have similar thermal conductivity, boiling points, and bond dissociation energies; thus, similar treatment performance by incineration could be achieved.

Based on the similarities discussed above, treatment performance data from test 13 were transferred to K042, K085, and K105. Treatment performance data for test 13 are included in Tables 4-2 through 4-5. This test is described in Section 4.1.1 of this document, and is discussed in more detail in the Onsite Engineering Report for the Third Thirds Incineration Treatment Test (Reference 23).

The U and P wastes included in this treatability group are U037, U070, U071, U072, U127, U183, U185, and U207. Table 4-8 includes the constituent concentrations for untreated waste, ash, and scrubber water for waste constituents that were detected in at least one of the 14 tests listed in Table 4-1. Table 4-9 presents the highest detection limits for 1,3-dichlorobenzene in ash and scrubber water in each of the 14 tests.

4.1.3 Group 3 - Chlorophenoxy Carboxylic Acids and Derivatives

The U and D waste codes included in this treatability group are D016, D017, and U240. Table 4-10 includes the constituent concentrations for untreated waste, ash, and scrubber water for 2,4-dichlorophenoxyacetic acid which was detected in tests 13 and 14 (see Table 4-1). Table 4-11 presents available detection limits for 2,4,5-TP (Silvex) in ash and scrubber water for the 14 tests.

4.1.4 Group 4 - Chlorinated Diphenyls

The U and D wastes included in this treatability group are D014, U038, U060, U061, U132, and U247. Table 4-12 includes the constituent concentrations for untreated waste, ash, and scrubber water for methoxychlor that was detected in test 13. Table 4-13 presents the waste constituents that were not detected in any of the 14 tests and the highest detection limits for those waste constituents in ash and scrubber water in each test.

Treatment performance data for the o,p'-isomers for DDD, DDE, and DDT (U060 and U061) are not available. Therefore, treatment performance data were transferred from the p,p'-isomers for the purpose of developing BDAT treatment standards based on structural similarity.

4.1.5 Group 5 - Lindane and Hexachlorobutadiene

The U and D wastes included in this treatability group are D013, U128, and U129. Table 4-14 includes the constituent concentrations for untreated waste, ash, and scrubber water for hexachlorobutadiene that was detected in tests 4 and 13. Table 4-15 presents the waste constituents that were not detected in any of the 14 tests and the highest detection limits for those waste constituents in ash and scrubber water in each test.

4.2 Halogenated Phenolics

The wastes included in this treatability group are U039, U048, U081, and U082. Table 4-16 includes the constituent concentrations for untreated waste, ash, and scrubber water for waste constituents that were detected in at least one of the 14 tests listed in Table 4-1. Table 4-17 presents the waste constituents that were not detected in any of the 14 tests and the highest detection limits for those waste constituents in ash and scrubber water in each test.

4.3 Phenolics

The U and P wastes included in this treatability group are U052, U101, U170, U188, U201, and P020, P034, P047, P048. Table 4-18 includes the constituent concentrations for untreated waste, ash, and scrubber water for 2-sec-butyl-4,6-dinitrophenol, m- and p-cresol, o-cresol, and phenol that were detected in one or more of the 14 incineration tests. Table 4-19 presents the waste constituents that were not detected in any of the 14 tests and the highest detection limits for those waste constituents in ash and scrubber water in each test. EPA lacks methods to quantitatively analyze for 2-cyclohexyl-4,6-dinitrophenol, the constituent for which P034 was listed, in complex waste matrices. Therefore, treatment performance data are not available for this constituent.

Table 4-1

WASTES TESTED BY INCINERATION

Test Number	Waste Code(s) Tested	Technology Used
1	K001-Pentachlorophenol Waste	Rotary Kiln
2	K001-Creosote Waste	Rotary Kiln
3	K011,K013,K014	Rotary Kiln
4	K019	Rotary Kiln
5	K024	Rotary Kiln
6	K037	Rotary Kiln
7	K048,K051	Fluidized Bed
8	K087	Rotary Kiln
9	K101	Rotary Kiln
10	K102	Rotary Kiln
11	F024	Rotary Kiln
12	K015	Liquid Injection
13	D014,D016,P059*,U127*,U192*	Rotary Kiln
14	U141*,U028*,P020*,U112*,U226*, U239*,U080*,U220*,U166*,U161*, U188*	Rotary Kiln

* - Commercial chemical products were used in these test burns as surrogates for these wastes.

Table 4-2

CHARACTERIZATION DATA FOR WASTE TREATED AT TESTS 13 AND 14

BDAT List Constituents	Concentration in the Untreated Waste from Test 13 (ppm)	Concentration in the Untreated Waste from Test 14 (ppm)
Volatile Organics		
7. Carbon Tetrachloride	560	<5,000
38. Methylene chloride	63	87,000
229. Methyl isobutyl ketone	130	52,000
43. Toluene	63	69,000
45. 1,1,1-Trichloroethane	63	130,000
Semivolatile Organics		
70. Bis(2-ethylhexyl)phthalate	<19	28,000
73. 2-sec-Butyl-4,6-dinitropheno	<19	77,000
90. 2,4-Dichlorophenol	140	<400
110. Hexachlorobenzene	13000	<400
111. Hexachlorobutadiene	22	<400
112. Hexachlorocyclopentadiene	120	<400
117. Isosafrole	<19	35,000
122. 1,4-Naphthoquinone	<19	28,000
142. Phenol	<19	13,000
144. Pronamide	24000	<400
Metals		
154. Antimony	10.5	<2.4
155. Arsenic	2.2	<1.0
156. Barium	76.1	0.42
157. Beryllium	0.31	<0.1
158. Cadmium	<0.5	1.2
159. Chromium (Total)	41.2	1.2
160. Copper	27.9	9.8
161. Lead	3.8	4.4
163. Nickel	19.7	2.0
167. Vanadium	18.2	<0.3
168. Zinc	45.1	17.3
Inorganics		
169. Cyanide	<0.47	3.4
170. Fluoride	6	0.1
Organochlorine Pesticides		
177. Chlordane (alpha and gamma)	6600	<2.0
186. Heptachlor	16000	<0.99
190. Methoxychlor	50000	<2.0

Source: Onsite Engineering Report for the Third Third Incineration Test (Reference 23).

Table 4-3

ANALYTICAL RESULTS FOR INCINERATOR ASH FROM TESTS 13 AND 14

BDAT List Constituents	Concentration in Kiln Ash Total Composition (mg/kg) Test 13				Concentration in Kiln Ash Total Composition (mg/kg) Test 14			
	Sample Set #1	Sample Set #2	Sample Set #3	Sample Set #4	Sample Set #1	Sample Set #2	Sample Set #3	Sample Set #4
Volatile Organics								
7. Carbon Tetrachloride	0.008	<0.005	<0.01	0.048	<0.01	<0.01	<0.01	<0.01
38. Methylene Chloride	<0.005	0.012	0.015	0.090	0.016	<0.01	<0.01	<0.01
Metals								
154. Antimony	8.4	<2.4	5.2	9.3	<2.4	<2.4	<2.4	2.8
155. Arsenic	2.1	2	2.5	2.1	3.1	2.8	3.0	2.4
156. Barium	59.3	12.4	22.8	82.2	12.3	9.3	16.1	17.4
157. Beryllium	0.21	<0.1	<0.1	0.26	<0.1	<0.1	<0.1	<0.1
159. Chromium (Total)	10	2.2	2.8	15.1	1.7	1.0	2.5	2.7
160. Copper	64	13.7	41.1	29.9	3.5	1.6	3.4	3.0
161. Lead	4	5	2	1.8	0.83	1.1	1.5	<0.5
162. Mercury	<0.1	0.61	<0.1	3.5	<0.1	<0.1	<0.1	<0.1
163. Nickel	15.2	3.7	14.4	18.5	1.5	1.3	2.5	2.3
167. Vanadium	8.5	1.9	2.5	12.3	5.7	4.6	6.7	9.2
168. Zinc	9.6	2.3	4.9	6.2	2.7	3.7	3.6	3.5
Inorganics								
170. Fluoride	0.4	0.4	NA	NA	NA	2.7	NA	NA
171. Sulfide	NA	3,060	NA	NA	NA	<1.0	NA	NA
Phenoxyacetic Acid Herbicides								
192. 2,4-Dichlorophenoxy acetic acid	0.021	<0.2	<0.2	<0.2	0.002	0.0019	0.002	0.002

NA - Not Analyzed.

Source: Onsite Engineering Report for the Third Third Incineration Test (Reference 23).

Table 4-4

ANALYTICAL RESULTS FOR SCRUBBER WATER FROM TESTS 13 AND 14

BDAT List Constituents	Concentration in Scrubber Water Total Composition (mg/l) Test 13				Concentration in Scrubber Water Total Composition (mg/l) Test 14			
	Sample Set #1	Sample Set #2	Sample Set #3	Sample Set #4	Sample Set #1	Sample Set #2	Sample Set #3	Sample Set #4
Metals								
154. Antimony	1.36	NA	NA	NA	0.285	NA	NA	NA
155. Arsenic	1.98	NA	NA	NA	0.348	NA	NA	NA
156. Barium	1.70	NA	NA	NA	0.131	NA	NA	NA
157. Beryllium	0.0019	NA	NA	NA	<0.001	NA	NA	NA
158. Cadmium	0.826	NA	NA	NA	0.0618	NA	NA	NA
159. Chromium (Total)	41.4	NA	NA	NA	5.38	NA	NA	NA
160. Copper	17.8	NA	NA	NA	2.91	NA	NA	NA
161. Lead	20.3	NA	NA	NA	2.48	NA	NA	NA
162. Mercury	0.0044	NA	NA	NA	0.00038	NA	NA	NA
163. Nickel	15.6	NA	NA	NA	2.46	NA	NA	NA
165. Silver	0.0799	NA	NA	NA	0.0139	NA	NA	NA
166. Thallium	0.022	NA	NA	NA	0.013	NA	NA	NA
167. Vanadium	0.36	NA	NA	NA	0.0636	NA	NA	NA
168. Zinc	40.2	NA	NA	NA	3.35	NA	NA	NA
Inorganics								
170. Fluoride	56.4	NA	NA	NA	23	25	NA	NA
171. Sulfide	NA	129	NA	NA	NA	11.8	NA	NA
Phenoxyacetic Acid Herbicides								
192. 2,4-Dichlorophenoxy acetic acid	0.0074	0.0069	0.011	0.0041	<0.00013	<0.00013	<0.00013	<0.00013

NA - Not Analyzed.

Source: Onsite Engineering Report for the Third Third Incineration Test (Reference 23).

Table 4-5

DESIGN AND OPERATING DATA FOR THE INCINERATION SYSTEM AT TESTS 13 AND 14

TEST 13

Time of Data Collection	Corresponding Sample Set	Kiln Temperature (F)	Solids Mixture Feed Rate (lbs/hr)	Kiln Rotational Speed (rpm)	Primary Afterburner Temperature (F)
1200	pre-test	NR	740	0.32	NR
1300	pre-test	NR	740	0.32	NR
1345	pre-test	1400 - 1700	740	0.32	1700 - 1800
1545	pre-test	1400 - 1700	740	0.32	1700 - 1800
1615	pre-test	1400 - 1700	740	0.32	1700 - 1800
1630	pre-test	1400 - 1700	740	0.32	1700 - 1800
1645	pre-test	1400 - 1700	740	0.32	1700 - 1800
1700	sample set #1	1500 - 1700	740	0.32	1800
1715	sample set #1	1500 - 1700	740	0.32	1800
1730	sample set #1	1500 - 1700	740	0.32	1800
1745	sample set #1	1500 - 1700	740	0.32	1800
1815	sample set #2	1600 - 1800	740	0.32	1800 - 1900
1830	sample set #2	1600 - 1800	740	0.32	1800 - 1900
1845	sample set #2	1600 - 1800	740	0.32	1800 - 1900
1900	sample set #3	1700 - 1900	740	0.32	1800 - 1900
1930	sample set #3	1700 - 1900	740	0.32	1800 - 1900
2000	sample set #4	1600 - 1800	740	0.32	1800
2015	sample set #4	1600 - 1800	740	0.32	1800
2030	sample set #4	1600 - 1800	740	0.32	1800
2045	sample set #4	1600 - 1800	740	0.32	1800

TEST 14

Time of Data Collection	Corresponding Sample Set	Kiln Temperature (F)	Soil Feed Rate (lbs/hr)	Liqiud Mixture Feed Rate (gal/hr)	Kiln Rotational Speed (rpm)	Primary Afterburner Temperature (F)
0830	pre-test	1600 - 1800	540	0	0.25	1800
0915	begin liquid feed	1600 - 1800	NR	24	NR	NR
0930	pre-test	1600 - 1800	540	28	0.25	1800
1000	pre-test	1600 - 1800	540	28	0.25	1800
1055	sample set #1	1700	540	28	0.25	1700 - 1800
1145	sample set #2	1700	540	28	0.25	1800
1215	sample set #2	1700	540	28	0.25	1800
1245	sample set #3	1700	540	28	0.25	1800
1315	sample set #3	1700	540	28	0.25	1800
1345	sample set #4	1700 - 1800	540	28	0.25	1600 - 2000
1410	kiln shut off	1800	NR	NR	0.25	1800

NR - Not Reported.

Source: Onsite Engineering Report for the Third Third Incineration Test (Reference 23).

Table 4-6

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 1 U AND P WASTES)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
U130	112	Hexachlorocyclopentadiene	13	120 - 1,800	<0.31[1],<0.33[2],<0.36[1]	<0.01[2],<0.011[2]
U036	177	Chlordane	13	6,600 - 44,900	<0.013[4]	<0.0001[4]
P059	186	Heptachlor	13	16,000 - 88,000	<0.0066[3],<0.0065[1]	<0.00005[4]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-7

DETECTION LIMITS FOR WASTE CONSTITUENTS IN THE MISCELLANEOUS HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 1 U AND P WASTES)

Waste Code	BDAT #	Constituent	Test No.* ->	Detection Limit (ppm) 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																	
P004	172	Aldrin		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
P037	181	Dieldrin		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.013	0.013
P050	182	Endosulfan I		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
P050	183	Endosulfan II		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.013	0.013
D012	184	Endrin		NA	0.001	0.000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.013	0.013
P051	184	Endrin		NA	0.001	0.000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.013	0.013
P051	185	Endrin Aldehyde		NA	0.002	0.000003	NA	NA	0.002	NA	NA	NA	NA	NA	**	0.013	0.013
P059	187	Heptachlor Epoxide		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
P060	188	Isodrin		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	NR	NR
U142	189	Kepone		NA	0.006	NR	NA	NA	0.006	NA	NA	NA	NA	NA	**	NR	NR
D015	191	Toxaphene		NA	0.1	0.0002	NA	NA	0.1	NA	NA	NA	NA	NA	**	0.13	0.13
P123	191	Toxaphene		NA	0.1	0.0002	NA	NA	0.1	NA	NA	NA	NA	NA	**	0.13	0.13
P050	238	Endosulfan Sulfate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**	0.013	0.013
Scrubber Water																	
P004	172	Aldrin		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.00005	0.00006
P037	181	Dieldrin		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.0001	0.00013
P050	182	Endosulfan I		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.00005	0.00006
P050	183	Endosulfan II		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.0001	0.00013
D012	184	Endrin		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.0001	0.00013
P051	184	Endrin		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.0001	0.00013
P051	185	Endrin Aldehyde		NA	0.00006	0.00003	NA	NA	0.00006	NA	NA	NA	NA	NA	NA	0.0001	0.00013
P059	187	Heptachlor Epoxide		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.00005	0.00006
P060	188	Isodrin		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	NR	NR
U142	189	Kepone		NA	0.00016	NR	NA	NA	0.00016	NA	NA	NA	NA	NA	NA	NR	NR
D015	191	Toxaphene		NA	0.002	0.002	NA	NA	0.002	NA	NA	NA	NA	NA	NA	0.001	0.0013
P123	191	Toxaphene		NA	0.002	0.002	NA	NA	0.002	NA	NA	NA	NA	NA	NA	0.001	0.0013
P050	238	Endosulfan Sulfate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0001	0.00013

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NA - Not Available

NR - Not Reported

Table 4-8

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 2 U AND P WASTES)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
U037	9	Chlorobenzene	4	3,000	<2[6]	<0.002[6]
			13	0.027	<0.005[1],<0.01[3]	<0.005[4]
U070	87	1,2-Dichlorobenzene	4	250	<2[6]	<0.002[6]
			11	302	<0.333[5],<0.351[1]	<0.0121[1],<0.0116[1],<0.0108[1],<0.0104[1],<0.0106[1],<0.0107[1]
U072	88	1,4-Dichlorobenzene	4	74 - 90	<2[6]	<0.002[6]
			11	2.08	<0.333[5],<0.351[1]	<0.0121[1],<0.0116[1],<0.0108[1],<0.0104[1],<0.0106[1],<0.0107[1]
U127	110	Hexachlorobenzene	4	60 - 87	<10[6]	<0.01[6]
			11	0.63-2.06	<0.333[5],<0.351[1]	<0.0121[1],<0.0116[1],<0.0108[1],<0.0104[1],<0.0106[1],<0.0107[1]
			13	13,000	<0.31[1],<0.33[2],<0.36[1]	<0.01[2],<0.011[2]
U183	136	Pentachlorobenzene	4	51 - 65	<10[6]	<0.01[6]
			13	24	<0.31[1],<0.33[2],<0.36[1]	<0.01[2],<0.011[2]
U185	138	Pentachloronitrobenzene	13	1,300	<0.33[3],<0.36[1]	<0.01[2],<0.011[2]
U207	148	1,2,4,5-Tetrachlorobenzene	4	62 - 88	<5[6]	<0.005[6]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-9

DETECTION LIMITS FOR WASTE CONSTITUENTS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 2 U AND P WASTES)

			Detection Limit (ppm)													
Waste Code	BDAT #	Constituent	Test No.* -> 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																
U071	86	1,3-Dichlorobenzene	0.5	0.13	0.01	2	0.50	0.4	0.2	1	0.42	1	0.351	**	0.36	0.36
Scrubber Water																
U071	86	1,3-Dichlorobenzene	0.01	0.002	0.01	0.002	0.01	0.01	0.01	0.02	0.01	0.01	0.0121	0.01	0.011	0.013

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

Table 4-10

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 3 U AND P WASTES)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
D016	192	2,4-Dichlorophenoxyacetic acid	13	0.35 - 17	0.002[1],<0.2[3]	0.0041[1],0.0069[1],0.0074[1],0.011[1] #
			14	0.35 - 17	<0.002[2],0.067[1],0.23[1]	<0.00013[4]
U240	192	2,4-Dichlorophenoxyacetic acid	13	0.35 - 17	0.002[1],<0.2[3]	0.0041[1],0.0069[1],0.0074[1],0.011[1] #
			14	0.35 - 17	<0.002[2],0.067[1],0.23[1]	<0.00013[4]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-11

DETECTION LIMITS FOR WASTE CONSTITUENTS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 3 U AND P WASTES)

				Detection Limit (ppm)													
Waste Code	BDAT #	Constituent	Test No.* ->	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																	
D017	193	2,4,5-TP (Silvex)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**	0.2	0.002
Scrubber Water																	
D017	193	2,4,5-TP (Silvex)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2	0.002

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NA - Not Available

Table 4-12

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 4 U AND P WASTES)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
D014	190	Methoxychlor	13	50,000 - 190,000	<0.013[4]	<0.0001[4]
U247	190	Methoxychlor	13	50,000 - 190,000	<0.013[4]	<0.0001[4]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-13

DETECTION LIMITS FOR WASTE CONSTITUENTS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 4 U AND P WASTES)

Waste Code	BDAT #	Constituent	Test No.* -> 1	2	3	4	5	6	7	8	9	10	11	12	13	14
			Detection Limit (ppm)													
Incinerator Ash																
U038	75	Chlorobenzilate	NR	0.27	NR	NR	NR	NR	NA	NR	NR	NR	0.702	**	0.36	0.36
U132	114	Hexachlorophene	NR	NR	NR	NR	NR	0.4	NR	NR	NR	NR	NA	**	NR	NR
U060	178	p,p-DDD	NA	0.002	0.000003	NA	NA	0.002	NA	NA	NA	NA	NA	**	0.013	0.013
U061	178	p,p-DDD	NA	0.002	0.000003	NA	NA	0.002	NA	NA	NA	NA	NA	**	0.013	0.013
U061	179	p,p-DDE	NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.013	0.013
U061	180	p,p-DDT	NA	0.002	0.000003	NA	NA	0.002	NA	NA	NA	NA	NA	**	0.013	0.013
Scrubber Water																
U038	75	Chlorobenzilate	NR	0.004	NR	NR	0.1	NR	0.01	0.01	NR	NR	0.0242	NR	0.011	0.013
U132	114	Hexachlorophene	NR	NR	NR	NR	20	NR	0.05	NR	NR	NR	NA	NR	NR	NR
U060	178	p,p-DDD	NA	0.00006	0.00003	NA	NA	0.00006	NA	NA	NA	NA	NA	NA	0.0001	0.00013
U061	178	p,p-DDD	NA	0.00006	0.00003	NA	NA	0.00006	NA	NA	NA	NA	NA	NA	0.0001	0.00013
U061	179	p,p-DDT	NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	NA	0.0001	0.00013
U061	180	p,p-DDT	NA	0.00006	0.00003	NA	NA	0.00006	NA	NA	NA	NA	NA	NA	0.0001	0.00013

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NA - Not Available

NR - Not Reported

Table 4-14

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 5 U AND P WASTES)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
U128	111	Hexachlorobutadiene	4	210	<10[6]	<0.01[6]
			13	22 - 230	<0.31[1],<0.33[2],<0.36[1]	<0.01[2],<0.011[2]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-15

DETECTION LIMITS FOR WASTE CONSTITUENTS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES (GROUP 5 U AND P WASTES)

Waste Code	BDAT #	Constituent	Test No.* ->	Detection Limit (ppm)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																	
U129	173	alpha-BHC		NA	0.0005	0.0000008	NA	NA	0.0005	NA	NA	NA	NA	NA	**	0.0066	0.0066
U129	174	beta-BHC		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
U129	175	delta-BHC		NA	0.001	0.0000015	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
D013	176	gamma-BHC (Lindane)		NA	0.001	0.000001	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
U129	176	gamma-BHC (Lindane)		NA	0.001	0.000001	NA	NA	0.001	NA	NA	NA	NA	NA	**	0.0066	0.0066
Scrubber Water																	
U129	173	alpha-BHC		NA	0.00002	0.000008	NA	NA	0.00002	NA	NA	NA	NA	NA	**	0.00005	0.00006
U129	174	beta-BHC		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	**	0.00005	0.00006
U129	175	delta-BHC		NA	0.00003	0.000015	NA	NA	0.00003	NA	NA	NA	NA	NA	**	0.00005	0.00006
D013	176	gamma-BHC (Lindane)		NA	0.00002	0.00001	NA	NA	0.00002	NA	NA	NA	NA	NA	NA	0.00005	0.00006
U129	176	gamma-BHC (Lindane)		NA	0.00002	0.00001	NA	NA	0.00002	NA	NA	NA	NA	NA	NA	0.00005	0.00006

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NA - Not Available

Table 4-16

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - HALOGENATED (U AND P WASTE)

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
U081	**90**	**2,4-Dichlorophenol**	4	420	<5[6]	<0.005[6]
			13	140	<0.31[1],<0.33[2],<0.36[1]	<0.01[2],<0.011[2]
U082	**91**	**2,6-Dichlorophenol**	4	500	<5[6]	<0.005[6]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-17

DETECTION LIMITS FOR WASTE CONSTITUENTS IN HALOGENATED PHENOLICS (U AND P WASTES)

Waste Code	BDAT #	Constituent	Test No.* ->	Detection Limit (ppm) 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																	
U039	76	p-Chloro-m-Cresol		0.5	0.2	0.01	5	0.5	0.4	0.5	1	0.42	1	0.351	**	0.36	0.36
U048	78	2-Chlorophenol		0.5	0.22	0.01	2	0.5	0.4	0.2	1	0.42	1	0.351	**	0.36	0.36
Scrubber Water																	
U039	76	p-Chloro-m-Cresol		0.01	NR	0.01	0.005	0.01	0.01	0.02	0.01	0.01	0.01	0.0121	0.01	0.011	0.013
U048	78	2-Chlorophenol		0.01	0.004	0.01	0.002	0.01	0.01	0.01	0.02	0.01	0.01	0.0121	0.01	0.011	0.013

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NR - Not Reported

Table 4-18

WASTE CONSTITUENTS DETECTED IN THE UNTREATED OR TREATED WASTES - PHENOLICs

Waste Code	BDAT #	Waste Constituent	Treatment Test Detected In (#)*	Concentration In Untreated Waste (ppm)**	Concentration In Ash (ppm/[# of sample sets])**	Concentration In Scrubber Water (ppm/[# of sample sets])**
P020	73	2-sec-Butyl-4,6-Dinitrophenol	14	77,000	<0.33[3],<0.36[1]	<0.013[1]
U052	81	o-Cresol	4	20	<2[6]	<0.002[6]
U052	82	p-Cresol (m- and p- isomers)	8	894 - 1,026	<1[5]	<0.01[6]
U188	142	Phenol	2	2,400 - 3,900	<0.1[6]	<0.002[6]
			4	78	<2[6]	<0.002[6]
			8	894 - 1,026	<1[5]	<0.01[6]
			10	0.010	<1[4]	0.015[1],0.017[2],0.019[1],0.022[1],0.023[1] #
			11	1842	<0.333[5],<0.351[1]	<0.0121[1],<0.0116[1],<0.0108[1],<0.0104[1],<0.0106[1
			14	13,000	<0.33[3],<0.36[1]	<0.013[4]

* - Treatment test # is indicated in Table 4-1.

** - Number in parenthesis indicates the number of sample sets the value was reported.

Table 4-19

DETECTION LIMITS FOR WASTE CONSTITUENTS FOR PHENOLICS

			Detection Limit (ppm)													
Waste Code	BDAT #	Constituent Test No.* ->	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Incinerator Ash																
P047	100	4,6-Dinitro-o-Cresol and Salts	2.5	1.6	0.05	50	2.5	2	5	5	2	5	1.76	**	1.7	1.7
P048	101	2,4-Dinitrophenol	2.5	2.8	0.05	50	2.5	2	5	5	2	5	1.76	**	1.7	1.7
U101	96	2,4-Dimethyl Phenol	0.5	0.18	0.01	5	0.5	0.4	0.5	1	0.42	1	0.351	**	0.36	0.36
U170	127	4-Nitrophenol	2.5	0.16	0.05	10	2.5	2	1	5	2	5	1.76	**	1.7	1.7
U201	146	Resorcinol	0.5	NR	NR	NR	0.5	400	NA	NR	NR	NR	0.351	**	NR	NR
Scrubber Water																
P047	100	4,6-Dinitro-o-Cresol and Salts	0.05	0.025	0.05	0.05	0.05	0.05	0.05	NR	0.05	0.05	0.0605	0.05	0.056	0.063
P048	101	2,4-Dinitrophenol	0.05	0.044	0.05	0.05	0.05	0.05	0.05	0.01	0.05	0.05	0.0605	0.05	0.056	0.063
U101	96	2,4-Dimethyl Phenol	0.01	0.003	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.0121	0.01	0.011	0.013
U170	127	4-Nitrophenol	0.05	0.003	0.05	0.01	0.05	0.05	0.05	NR	0.05	0.05	0.0605	0.05	0.056	0.063
U201	146	Resorcinol	0.01	NR	NR	NR	1	1	0.01	0.02	NR	NR	0.0121	0.01	NR	NR

* - Treatment test # is indicated in Table 4-1.

** - Incinerator ash samples were not collected for Test 12.

NR - Not Reported

5.0 SELECTION OF REGULATED CONSTITUENTS

This section presents the methodology and rationale for selection of regulated constituents in halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic nonwastewaters and wastewaters. Generally, regulated constituents must satisfy the following criteria:

1. They must be on the BDAT List of constituents. (Presence on the BDAT List means that approved methods exist for analyzing the constituent in treated waste matrices.)
2. They must be present in or be suspected of being present in the untreated waste. For example, analytical difficulties may prevent a constituent from being identified in the untreated waste, but its identification in a treatment residual may lead the Agency to conclude that it is present in the untreated waste.

For the K-wastes, the Agency initially considered all constituents on the BDAT List for regulation. BDAT List constituents were deleted from consideration for regulation if: (1) the constituent was not detected in the untreated waste and is not suspected of being present in the waste; or (2) the constituent was not analyzed for in the untreated waste. Table 5-1, at the end of this section, summarizes available waste characterization data for K032, K033, K034, K041, K042, K085, K097, K098, and K105 for the BDAT List constituents (as derived from Table 2-3). Ranges of concentrations for constituents detected in the wastes are shown in the table. All constituents detected in K032, K033, K034, K041, K042, K085, K097, K098, and K105 were selected for proposed regulation. In addition, several waste constituents expected to be present in the wastes as indicated in Table 5-1 were also selected for regulation.

K032 and K097 wastes are expected to contain heptachlor as indicated in Table 5-1. The Agency believes that heptachlor can be commonly converted to heptachlor epoxide in environmental samples. Therefore, the Agency is also selecting heptachlor epoxide from proposed regulation in K032 and K097.

Due to the lack of characterization data for the P, U, and D wastes, only the constituents for which the wastes were listed have been selected for proposed regulation. Exceptions include the following waste codes: U052, U060, U061, U129, P034, P050, P051, and P059. These exceptions are discussed in greater detail in the following subsections.

The waste constituents selected for proposed regulation in halogenated pesticide and chlorobenzene, halogenated phenolic, and phenolic nonwastewaters and wastewaters are summarized in Table 5-2.

U052 - Cresols

U052 is listed as "cresols (cresylic acid)." Cresylic acid is the name given to a mixture of three isomeric cresols (methyl phenols), in which the meta-cresol predominates. Thus, U052 typically contains various levels of ortho-cresol, meta-cresol, and para-cresol. Current analytical methods cannot distinguish between the meta and para isomers of cresol. Therefore, the Agency is selecting ortho-cresol and a combination of meta and para-cresol for proposed regulation in K052.

U060 and U061 - DDD and DDT

DDD and DDT, the compounds for which U060 and U061 were respectively listed, can both exist as one of two isomers: o,p'-DDD and p,p'-DDD, and o,p'-DDT and p,p'-DDT. Each of these isomers can be analyzed by SW-846 Method 8080 for organochlorine pesticides. Therefore, the Agency is selecting both isomers for proposed regulation in U060 and U061. In addition, DDD and DDE are common breakdown products of DDT. Accordingly, the Agency is also selecting the p,p' and o,p' isomers of both DDD and DDE for proposed regulation in U060 wastes.

U129 - Lindane

Lindane (represented by U129) is the gamma-isomer of a class of compounds known as hexachlorocyclohexanes and is often referred to as "gamma-BHC." (BHC is an abbreviation for benzene hexachloride which is a misnomer since benzene is not part of the chemical structure.) Lindane is the most common isomer of hexachlorocyclohexane (BHC). Typical commercial mixtures of Lindane include the three other BHC isomers, alpha-, beta-, and gamma-BHC, at high concentrations. Therefore, the Agency is selecting all four BHC isomers for proposed regulation in U129.

P034 - 2-Cyclohexyl-4,6-dinitrophenol

The Agency lacks methods to quantitatively analyze for 2-cyclohexyl-4,6-dinitrophenol in complex waste matrices. Selection of this constituent for proposed regulation in P034 would not be appropriate. In addition, the Agency has not identified a surrogate constituent for regulation. Therefore, the Agency is not selecting any constituents for proposed regulation in P034 and is instead specifying a method of treatment as the BDAT treatment standard.

P050 - Endosulfan

Endosulfan, the compound for which P050 was listed as a hazardous waste, commonly exists as a mixture of two isomers: endosulfan I and endosulfan II. Both can be analyzed by SW-846 Method 8080 for organochlorine pesticides. Accordingly, both isomers were selected for proposed regulation in P050. In addition, endosulfan can be converted to endosulfan sulfate in environmental samples. Therefore, the Agency is also selecting endosulfan sulfate for proposed regulation in P050.

P051 - Endrin and Metabolites

The most common metabolite of endrin is endrin aldehyde. The Agency is selecting both endrin and endrin aldehyde for proposed regulation in P051.

P059 - Heptachlor

Heptachlor can be commonly converted to heptachlor epoxide in environmental samples. Therefore, the Agency is selecting both heptachlor and heptachlor epoxide for proposed regulation in P059.

Table 5-1

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K-PESTICIDES WASTES[a]

BDAT List Constituent	Untreated Waste Concentration (%)								
	K032	K033	K034	K041	K042	K085	K097	K098	K105
Volatiles									
4. Benzene	NA	NA	NA	NA	NA	trace-1	NA	NA	0.18
9. Chlorobenzene	NA	NA	NA	NA	NA	0.1-50	NA	NA	0.008
Semivolatiles									
78. 2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	E
87. o-Dichlorobenzene	NA	NA	NA	NA	10	NA	NA	NA	0.05
88. p-Dichlorobenzene	NA	NA	NA	NA	35	NA	NA	NA	0.05
86-88. Dichlorobenzenes	NA	NA	NA	NA	NA	1-50	NA	NA	NA
110. Hexachlorobenzene	NA	NA	NA	NA	NA	E	NA	NA	NA
112. Hexachlorocyclopentadiene	5-75	E	5-25	NA	NA	NA	E	NA	NA
136. Pentachlorobenzene	NA	NA	NA	NA	25	E	NA	NA	NA
142. Phenol	NA	NA	NA	NA	NA	NA	NA	NA	E
148. Tetrachlorobenzene	NA	NA	NA	NA	E	0.01-10	NA	NA	NA
150. Trichlorobenzene	NA	NA	NA	NA	20	1-10	NA	NA	NA
151-152. Trichlorophenols	NA	NA	NA	NA	NA	NA	NA	NA	E
Organochlorine Pesticides									
177. Chlordane	E	NA	NA	NA	NA	NA	E	NA	NA
186. Heptachlor	E	NA	NA	NA	NA	NA	E	NA	NA
191. Toxaphene	NA	NA	NA	1	NA	NA	NA	E	NA
PCBs									
200-206. Aroclors	NA	NA	NA	NA	NA	0.1-1	NA	NA	NA

E - Expected to be present in the waste; however, no quantitative data are available.

NA - Not analyzed.

[a] - BDAT List constituents not detected or not expected to be present in these wastes are not shown on this table.

Table 5-2

BDAT LIST CONSTITUENTS SELECTED FOR PROPOSED REGULATION IN HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC NONWASTEWATERS AND WASTEWATERS

Waste Code	BDAT List Constituent
D012	184. Endrin
D013	176. gamma-BHC
D014	190. Methoxychlor
D015	191. Toxaphene
D016	192. 2,4-D
D017	193. 2,4,5-TP (Silvex)
U036	177. Chlordane
U037	9. Chlorobenzene
U038	75. Ethyl 4,4'-Chlorobenzilate
U039	76. p-Chloro-m-cresol
U048	78. 2-Chlorophenol
U052	81. o-Cresol
U052	82. p-Cresol (m- and p- isomers)
U060	178. p,p'-DDD
U060	235. o,p'-DDD
U061	180. p,p'-DDT
U061	237. o,p'-DDT
U061	178. p,p'-DDD
U061	235. o,p'-DDD
U061	179. p,p'-DDE
U061	236. o,p'-DDE
U070	87. 1,2-Dichlorobenzene
U071	86. 1,3-Dichlorobenzene
U072	88. 1,4-Dichlorobenzene
U081	90. 2,4-Dichlorophenol
U082	91. 2,6-Dichlorophenol
U101	96. 2,4-Dimethylphenol
U127	110. Hexachlorobenzene
U128	111. Hexachlorobutadiene

Table 5-2 (Continued)

BDAT LIST CONSTITUENTS SELECTED FOR PROPOSED REGULATION IN HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC NONWASTEWATERS AND WASTEWATERS

Waste Code	BDAT List Constituent
U129	173. alpha-BHC
U129	174. beta-BHC
U129	175. delta-BHC
U129	176. gamma-BHC (Lindane)
U130	112. Hexachlorocyclopentadiene
U132	114. Hexachlorophene
U142	189. Kepone
U170	230. 4-Nitrophenol
U183	136. Pentachlorobenzene
U185	138. Pentachloronitrobenzene
U188	142. Phenol
U201	146. Resorcinol
U207	148. 1,2,4,5-Tetrachlorobenzene
U240	192. 2,4-D
U247	190. Methoxychlor
P004	172. Aldrin
P020	73. Dinoseb
P034	NA
P037	181. Dieldrin
P047	100. 4,6-Dinitro-o-cresol
P048	101. 2,4-Dinitrophenol
P050	182. Endosulfan I
P050	183. Endosulfan II
P050	238. Endosulfan sulfate
P051	184. Endrin
P051	185. Endrin aldehyde
P059	186. Heptachlor
P059	187. Heptachlor epoxide
P060	188. Isodrin

NA - Not applicable since analytical methods are not available for analysis of this waste constituent in complex matrices.

Table 5-2 (Continued)

BDAT LIST CONSTITUENTS SELECTED FOR PROPOSED REGULATION IN HALOGENATED PESTICIDE AND CHLOROBENZENE, HALOGENATED PHENOLIC, AND PHENOLIC NONWASTEWATERS AND WASTEWATERS

Waste Code	BDAT List Constituent
P123	191. Toxaphene
K032	112. Hexachlorocyclopentadiene
	177. Chlordane
	186. Heptachlor
K033	112. Hexachlorocyclopentadiene
K034	112. Hexachlorocyclopentadiene
K041	191. Toxaphene
K042	87. o-Dichlorobenzene
	88. p-Dichlorobenzene
	136. Pentachlorobenzene
	148. 1,2 4,5-Tetrachlorobenzene
	150. 1,2,4-Trichlorobenzene
K085	4. Benzene
	9. Chlorobenzene
	86-88. Dichlorobenzenes
	110. Hexachlorobenzene
	136. Pentachlorobenzene
	148. 1,2,4,5-Tetrachlorobenzene
	150. 1,2,4-Trichlorobenzene
	200-206. Arochlors (PCBs)
K097	112. Hexachlorocyclopentadiene
	177. Chlordane
	186. Heptachlor
K098	191. Toxaphene
K105	4. Benzene
	9. Chlorobenzene
	78. 2-Chlorphenol
	87. o-Dichlorobenzene
	88. p-Dichlorobenzene
	142. Phenol
	151-152. Trichlorophenols

6.0 CALCULATION OF PROPOSED BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards account for analytical limitations in available treatment performance data and for variabilities related to treatment, sampling, and analytical techniques and procedures. The purpose of this section is to calculate proposed treatment standards for the constituents selected for regulation in Section 5.0 using the available treatment performance data from the BDAT treatment technologies. A discussion of how the treatment standards for these wastes were calculated is included in this section.

6.1 K Wastes

Treatment performance data are not available for the K-wastes included in this document. Therefore, treatment performance data were transferred from other similar wastes as discussed in Section 4.0. Treatment standards for these wastes were calculated as described below.

Before treatment standards were calculated, the treatment performance data were corrected to account for analytical interferences associated with the chemical matrices of the samples. A complete discussion of the accuracy correction of treatment data is provided in Appendix C. Appendix C also contains the matrix spike recoveries and accuracy correction factors used to correct the treatment performance data, as well as the corrected treatment performance data.

After treatment performance data were corrected for accuracy, the arithmetic average of the treatment performance data was calculated for each regulated constituent. In cases where the constituent was not detected, the detection limit was used to calculate the average constituent concentration in the treated waste.

The next step in calculating the treatment standards was to determine the variability factor (VF) for each regulated constituent. The variability factor accounts for the variability inherent in treatment system performance, treatment residual collection, and analysis of the treated waste samples. (For more information on calculation of variability factors, see EPA's Methodology for Developing BDAT Treatment Standards (Reference 2).

Finally, treatment standards were calculated for regulated constituents by multiplying the average of the corrected treatment performance values by the variability factor for the constituent. Details concerning the calculation of treatment standards are included in Section 6.3 for each treatability group.

6.2 U, P, and D Wastes

Treatment standards for U, P, and D wastes were calculated based on data compiled from the BDAT incineration database for incinerator ash and scrubber water residuals. Specifically, the Agency considered treatment performance data from the 14 incineration tests listed in Table 4-1. Alternate treatment standards for U and P wastewaters were calculated based on wastewater treatment data from EPA's Office of Water and EPA-conducted wastewater treatment tests. These data were not available in time for incorporation into this document; these data are included in the Wastewater Background Document (Reference 3) and in the administrative record for this rulemaking as discussed in Section 1.2.

For each U, P, and D waste code included in this document, the Agency first determined whether the waste constituents were detected in the untreated or treated wastes included in any of the 14 treatment tests. Data for these waste codes are included in Section 4.0. For waste constituents that were detected in the untreated or treated waste, treatment standards were developed based on the highest detection limits in ash and scrubber water from these tests. For waste constituents which were not detected in any of the untreated or treated wastes in the 14 treatment tests, the Agency developed treatment standards based on the highest detection limits for the ash and scrubber water residuals in the 14 treatment tests.

Treatment standards for waste constituents selected for regulation in Section 5.0 were calculated by multiplying the constituent detection limit in ash and scrubber water by an accuracy correction factor and by a variability factor. The following sections discuss these three components of the treatment standard calculation.

Detection Limits

Detection limits (presented in Section 4.0) for the ash and scrubber water residuals were used to calculate treatment standards for nonwastewater and wastewater forms of these wastes, respectively. In cases where the waste constituent was detected in more than one incineration test, the highest detection limits for the ash and scrubber water were used. For example, chlorobenzene (U037) was detected in two treatment tests (4 and 13) as indicated in Table 4-8. The highest detection limit for the ash samples was 2 ppm in test 4. Therefore, 2 ppm was entered onto Table 6-4 for chlorobenzene nonwastewaters. For scrubber water, the highest detection limit was 0.005 ppm in test 13. These data were entered onto Table 6-4 for chlorobenzene wastewaters.

For waste constituents not detected in any of the 14 tests, the highest detection limit reported for the 14 treatment tests was used. For example, aldrin (P004) was not detected in any of the 14 treatment tests. Detection limits for this constituent range from 0.0000015 ppm to 0.001 ppm as indicated in Table 4-7. Therefore, the detection limit of 0.001 ppm in tests 2 and 6 was entered onto Table 6-2 for aldrin nonwastewaters. Similarly, a detection limit of 0.00006 ppm from test 14 was entered onto Table 6-2 for aldrin wastewaters.

Exceptions to this general methodology are noted in the treatability group subsections included in Section 6.3.

Accuracy Correction Factors

The detection limits used to calculate treatment standards were corrected using matrix spike recovery data from that same test from which the detection limits were taken to account for analytical interferences associated with the chemical matrices of the samples. Detection limits were corrected for accuracy as follows.

- A matrix spike recovery was determined for each waste constituent. In cases where a matrix spike was not performed for a waste constituent from the treatment test for which the detection limit was used, the matrix spike recovery from a similar constituent from that treatment test was transferred to that constituent. The source of recovery data used for each constituent is indicated on Tables 6-1 through 6-7;
- An accuracy correction factor was determined for each of the above constituents by dividing 100 by the matrix spike recovery (percent) for that constituent; and
- Detection limits for each waste constituent were corrected by multiplying the reported concentration of each constituent by its corresponding accuracy correction factor.

Matrix spike recoveries that were used to adjust detection limits for each of the 14 incineration tests are included in Appendix C. Duplicate matrix spikes were performed for some waste constituents. If a duplicate matrix spike was performed for a constituent, the matrix spike recovery used for that constituent was the lower of the two values from the first matrix spike and the duplicate spike. Matrix spike recoveries of less than 20% are not acceptable and were not used to correct detection limits. Matrix spike recoveries greater than 100% were considered to be 100% for the purpose of this calculation so that the data were not adjusted to concentrations below the detection limits. In cases where the detection limit used was from more than one test, matrix spike recovery data from the test resulting in the highest accuracy correction factor was used. The test from which matrix spike recovery data were used is indicated in Tables 6-1 through 6-7.

Variability Factors

The variability factor accounts for the variability inherent in treatment system performance, treatment residual collection, and analysis of the treated waste samples. Variability factors could not be calculated for waste constituents that were not detected in the incinerator ash or scrubber water residuals. In these cases, a variability factor of 2.8 was used to account for this inherent variability. In some cases, constituents were detected in the ash or scrubber water and a variability factor could be calculated. Variability factor calculations are included in Appendix C. The variability factors used to calculate the treatment standards for each waste constituent are included in Tables 6-1 through 6-7.

6.3 Detailed Discussions of Treatment Standard Calculations by Treatability Group

6.3.1 Halogenated Pesticides and Chlorobenzenes - Group 1 (Chlorinated Norbornane and Norbornene Derivatives)

Treatment performance data for rotary kiln incineration of K032, K033, K034, K041, K097, and K098 are not available. Therefore, the Agency is transferring treatment performance data from rotary kiln incineration of wastes from test 13 to these waste codes. Specifically, treatment standards for K032, K033, K034, K041, K097, and K098 nonwastewaters and wastewaters were calculated based on total constituent concentration data transferred from incinerator ash and scrubber water, respectively, generated during test 13. The rationale for this transfer is presented in Section 4.0.

Treatment standards for K032, K033, K034, K041, K097, and K098 were calculated using four sets of incinerator ash and scrubber water data from test 13. Tables 4-2 through 4-4 of Section 4.0 present the total concentration of each constituent detected in the untreated waste and the treated residuals from test 13. Constituents selected for proposed regulation in K032, K033, K034, K041, K097, and K098 are hexachlorocyclopentadiene, chlordane, heptachlor, and toxaphene. Hexachlorocyclopentadiene, chlordane, and heptachlor were detected in the untreated waste from test 13. Accordingly, data from treatment of these constituents were used to develop treatment standards for these constituents in K032, K033, K034, K041, K097, and K098.

Chlordane is a mixture of alpha and gamma isomers that are generally difficult to distinguish analytically. Therefore, treatment performance data for chlordane represent the sum of these isomers. Since toxaphene is also a mixture of several isomers which are difficult to distinguish analytically, treatment performance data for chlordane were transferred to toxaphene for the purpose of developing treatment standards. Table 6-1 summarizes the calculation of treatment standards for these wastes.

Treatment standards for U, P, and D wastes were calculated according to the methodology described above. Summarized in Table 6-1 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes. The Agency is also proposing a second regulatory option for D012 and D015 based on treatment to the appropriate characteristic levels as measured in the EP leachate as discussed in Section 1.2.

6.3.2 Halogenated Pesticides and Chlorobenzene - Group 2 (Chlorobenzenes)

Treatment performance data for rotary kiln incineration of K042, K085, and K105 are not available. Therefore, the Agency is transferring treatment performance data from rotary kiln incineration of wastes from test 13 to these waste codes. Specifically, treatment standards for K042, K085, and K105 nonwastewaters and wastewaters were calculated based on total constituent concentration data transferred from incinerator ash and scrubber water, respectively, generated during test 13. The rationale for this transfer is presented in Section 4.0.

Treatment standards for K042, K085, and K105 were calculated using four sets of incinerator ash and scrubber water data from test 13. Tables 4-2 through 4-4 of Section 4.0 present the total concentration of each constituent detected in the untreated waste and the treated residuals from test 13. Constituents selected for proposed regulation in K042, K085, and K105 include benzene and chlorinated benzenes. Hexachlorobenzene was detected in the untreated waste from test 13. Accordingly, data from treatment of hexachlorobenzene were used to develop treatment standards for waste constituents in K042, K085, and K105. Table 6-2 summarizes the calculation of treatment standards for these wastes.

Treatment standards for U wastes were calculated according to the methodology described above. Summarized in Table 6-2 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes.

6.3.3 Halogenated Pesticides and Chlorobenzenes - Group 3 (Chlorophenoxycarboxylic Acids and Derivatives)

For U240 (2,4-D and salts and esters), the Agency is proposing both concentration-based treatment standards and specifying a method of treatment as the treatment standard. Because 2,4-D salts and esters are not analyzed as 2,4-D, numerical treatment standards for 2,4-D do not necessarily represent treatment of salts and esters of U240. Where a facility can reasonably assume that only 2,4-D is being handled, only the concentration-based treatment standards for 2,4-D would be applied. However, should one expect that salts or esters could be formed during storage, treatment, or disposal, the U240 nonwastewaters would have to be incinerated and the U240 wastewaters would have to be treated by wet air oxidation followed by carbon adsorption, chemical oxidation followed by carbon adsorption, or incineration according to the standard for U240 salts and esters.

Treatment standards for D and U wastes were calculated according to the methodology described above. Acceptable matrix spike recoveries for incinerator ash were not available for phenoxyacetic acid herbicides in test 13. Therefore, a recovery of 20% was used for these constituents. Summarized in Table 6-3 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes. The Agency is also proposing a second regulatory option for D016 and D017 based on treatment to the appropriate characteristic levels as measured in the EP leachate as discussed in Section 1.2.

6.3.4 Halogenated Pesticides and Chlorobenzenes - Group 4 (Chlorinated Diphenyls)

Treatment standards for D and U wastes were calculated according to the methodology described above. Summarized in Table 6-4 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes. The Agency is also proposing a second regulatory option for D014 based on treatment to the appropriate characteristic levels as measured in the EP leachate as discussed in Section 1.2.

6.3.5 Halogenated Pesticides and Chlorobenzenes - Group 5 (Lindane and Hexachlorobutadiene)

Treatment standards for D and U wastes were calculated according to the methodology described above. Summarized in Table 6-5 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes. The Agency is also proposing a second regulatory option for D013 based on treatment to the appropriate characteristic levels as measured in the EP leachate as discussed in Section 1.2.

6.3.6 Halogenated Phenolics

Treatment standards for U wastes were calculated according to the methodology described above. Summarized in Table 6-6 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes.

6.3.7 Phenolics

For P047 (4,6-dinitrophenol and salts), the Agency is proposing both concentration-based treatment standards and specifying a method of treatment as the treatment standard. Because 4,6-dinitrophenol salts are not analyzed as 4,6-dinitrophenol, numerical treatment standards for 4,6-dinitrophenol do not necessarily represent treatment of salts of P047. Where a facility can reasonably assume that only 4,6-dinitrophenol is being handled, only the concentration-based treatment standards for 4,6-dinitrophenol would be applied. However, should one expect that salts could be formed during storage, treatment, or disposal, the P047 nonwastewaters would have to be incinerated and the P047 wastewaters would have to be treated by wet air oxidation followed by carbon adsorption, chemical oxidation followed by carbon adsorption, biological treatment followed by carbon adsorption, or incineration according to the standard for P047 salts.

2-Cyclohexyl-4,6-dinitrophenol (P034) is not amenable to quantification in hazardous waste matrices using current analytical methods and development of numerical treatment standards would not be appropriate. Therefore, the Agency is specifying a method of treatment as the BDAT treatment standard for P034. The BDAT treatment standard for P034 nonwastewaters is incineration and the BDAT treatment standard for P034 wastewaters is wet air oxidation followed by carbon adsorption, chemical oxidation followed by carbon adsorption, biological treatment followed by carbon adsorption, or incineration.

The preponderance of data for Resourcinol indicate that detection limits of less than or equal to 0.5 ppm are routinely achievable in incinerator ash matrices. The detection limit achieved for Resourcinol in test 6 was 400 ppm; this value is 800 times greater than the routinely achievable detection limit of 0.5 ppm. Therefore, the Agency considers the detection limit for Resourcinol in test 6 incinerator ash to be an outlier. The next highest detection limit for Resourcinol in incinerator ash was used to calculate the nonwastewater treatment standards for Resourcinol as indicated in Table 6-7.

Treatment standards for the remaining U and P wastes in this treatability group were calculated according to the methodology described above.

Summarized in Table 6-7 are the detection limits, accuracy correction factors, and variability factors used to calculate treatment standards for these wastes.

Table 6-1

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 1 (CHLORINATED NORBORNANE AND NORBORNENE DERIVATIVES)

Regulated Constituent (SW-846 Method Number)	Constituents From Which Treatment Performance Data Were Transferred	Arithmetic Average of Corrected Treatment Performance Values (ppm)	Variability Factor (VF)	Treatment Standard (Average x VF) (ppm)
NONWASTEWATERS				
Semivolatile Organics (8270)				
K032 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.85	2.8	2.4
K033 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.85	2.8	2.4
K034 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.85	2.8	2.4
K097 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.85	2.8	2.4
Organochlorine Pesticides (8080)				
K032 Chlordane (alpha and gamma)	Chlordane (alpha and gamma)	0.093	2.8	0.26
Heptachlor	Heptachlor	0.024	2.8	0.066
Heptachlor epoxide	Heptachlor	0.024	2.8	0.066
K041 Toxaphene	Chlordane	0.93	2.8	2.6
K097 Chlordane (alpha and gamma)	Chlordane (alpha and gamma)	0.093	2.8	0.26
Heptachlor	Heptachlor	0.024	2.8	0.066
Heptachlor epoxide	Heptachlor	0.024	2.8	0.066
K098 Toxaphene	Chlordane	0.93	2.8	2.6
WASTEWATERS				
Semivolatile Organics (8270)				
K032 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.019	2.8	0.054
K033 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.019	2.8	0.054
K034 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.019	2.8	0.054
K097 Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	0.019	2.8	0.054
Organochlorine Pesticides (8080)				
K032 Chlordane (alpha and gamma)	Chlordane (alpha and gamma)	0.00014	2.8	0.00039
Heptachlor	Heptachlor	0.000078	2.8	0.00022
Heptachlor epoxide	Heptachlor	0.000078	2.8	0.00022
K041 Toxaphene	Chlordane	0.0014	2.8	0.0039
K097 Chlordane (alpha and gamma)	Chlordane (alpha and gamma)	0.00014	2.8	0.00039
Heptachlor	Heptachlor	0.000078	2.8	0.00022
Heptachlor epoxide	Heptachlor	0.000078	2.8	0.00022
K098 Toxaphene	Chlordane	0.0014	2.8	0.0039

Table 6-1 (Continued)

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 1 (CHLORINATED NORBORNANE AND NORBORNENE DERIVATIVES)

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
P004	172	Aldrin	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
P037	181	Dieldrin	N	0.013	13,14	28	186/13	3.57	0.05	2.8	0.13
P050	182	Endosulfan I	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
P050	183	Endosulfan II	N	0.013	13,14	28	186/13	3.57	0.05	2.8	0.13
P050	238	Endosulfan Sulfate	N	0.013	13,14	28	186/13	3.57	0.046	2.8	0.13
D012	184	Endrin	N	0.013	13,14	28	186/13	3.57	0.05	2.8	0.13
P051	184	Endrin	N	0.013	13,14	28	186/13	3.57	0.05	2.8	0.13
P051	185	Endrin aldehyde	N	0.013	13,14	28	186/13	3.57	0.05	2.8	0.13
P059	186	Heptachlor	Y	0.0066	13	28	186/13	3.57	0.02	2.8	0.066
P059	187	Heptachlor epoxide	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
P060	188	Isodrin	N	0.001	2,6	28	181/6	3.57	0.00	2.8	0.010
D015	191	Toxaphene	N	0.13	13,14	28	186/13	3.57	0.46	2.8	1.3
P123	191	Toxaphene	N	0.13	13,14	28	186/13	3.57	0.46	2.8	1.3
U036	177	Chlordane	Y	0.013	13	28	186/13	3.57	0.05	2.8	0.13
U130	112	Hexachlorocyclopentadiene	Y	0.36	13	21	186/13	4.76	1.71	2.8	4.8
U142	189	Kepone	N	0.006	2,6	39	181/6	2.56	0.02	2.8	0.043
Wastewater											
P004	172	Aldrin	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
P037	181	Dieldrin	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
P050	182	Endosulfan I	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
P050	183	Endosulfan II	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
P050	238	Endosulfan Sulfate	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
D012	184	Endrin	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
P051	184	Endrin	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
P051	185	Endrin aldehyde	N	0.00013	14	70	186/14	1.43	0.00019	2.8	0.00052
P059	186	Heptachlor	Y	0.00005	13	64	186/13	1.56	0.00008	2.8	0.00022
P059	187	Heptachlor epoxide	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
P060	188	Isodrin	N	0.00003	2,6	41	181/6	2.44	0.00007	2.8	0.00020
D015	191	Toxaphene	N	0.002	2,3,6	41	181/6	2.44	0.0049	2.8	0.014
P123	191	Toxaphene	N	0.002	2,3,6	41	181/6	2.44	0.0049	2.8	0.014
U036	177	Chlordane	Y	0.0001	13	64	186/13	1.56	0.00016	2.8	0.00044
U130	112	Hexachlorocyclopentadiene	Y	0.011	13	32	110/13	3.13	0.034	2.8	0.096
U142	189	Kepone	N	0.00016	6	41	181/6	2.44	0.00039	2.8	0.0011

* Treatment test number is indicated in Table 4-1.

Table 6-2

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 2 (CHLOROBENZENES)

Regulated Constituent (SW-846 Method Number)	Constituents From Which Treatment Performance Data Were Transferred	Arithmetic Average of Corrected Treatment Performance Values (ppm)	Variability Factor (VF)	Treatment Standard (Average x VF) (ppm)
NONWASTEWATERS				
Volatile Organics (8240)				
K085 Benzene	Hexachlorobenzene	1.6	2.8	4.4
Chlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
K105 Benzene	Hexachlorobenzene	1.6	2.8	4.4
Chlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
Semivolatile Organics (8270)				
K042 o-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
p-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
Pentachlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
1,2,4-Trichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
1,2,4,5-Tetrachlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
K085 o-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
m-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
p-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
Pentachlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
1,2,4-Trichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
1,2,4,5-Tetrachlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
Hexachlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
K105 o-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
p-Dichlorobenzene	Hexachlorobenzene	1.6	2.8	4.4
2-Chlorophenol	Hexachlorobenzene	1.6	2.8	4.4
Phenol	Hexachlorobenzene	1.6	2.8	4.4
2,4,5-Trichlorophenol	Hexachlorobenzene	1.6	2.8	4.4
2,4,6-Trichlorophenol	Hexachlorobenzene	1.6	2.8	4.4
PCBs (8080)				
K085 Aroclor 1016	Methoxychlor	0.33	2.8	0.92
Aroclor 1221	Methoxychlor	0.33	2.8	0.92
Aroclor 1232	Methoxychlor	0.33	2.8	0.92
Aroclor 1242	Methoxychlor	0.33	2.8	0.92
Aroclor 1248	Methoxychlor	0.33	2.8	0.92
Aroclor 1254	Methoxychlor	0.65	2.8	1.8
Aroclor 1260	Methoxychlor	0.65	2.8	1.8

Table 6-2 (Continued)

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 2 (CHLOROBENZENES)

Regulated Constituent (SW-846 Method Number)	Constituents From Which Treatment Performance Data Were Transferred	Arithmetic Average of Corrected Treatment Performance Values (ppm)	Variability Factor (VF)	Treatment Standard (Average x VF) (ppm)
WASTEWATERS				
Volatile Organics (8240)				
K085 Benzene	Hexachlorobenzene	0.033	2.8	0.092
Chlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
K105 Benzene	Hexachlorobenzene	0.033	2.8	0.092
Chlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
Semivolatile Organics (8270)				
K042 o-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
p-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
Pentachlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
1,2,4-Trichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
1,2,4,5-Tetrachlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
K085 o-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
m-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
p-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
Pentachlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
1,2,4-Trichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
1,2,4,5-Tetrachlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
Hexachlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
K105 o-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
p-Dichlorobenzene	Hexachlorobenzene	0.033	2.8	0.092
2-Chlorophenol	Hexachlorobenzene	0.033	2.8	0.092
Phenol	Hexachlorobenzene	0.033	2.8	0.092
2,4,5-Trichlorophenol	Hexachlorobenzene	0.033	2.8	0.092
2,4,6-Trichlorophenol	Hexachlorobenzene	0.033	2.8	0.092
PCBs (8080)				
K085 Aroclor 1016	Methoxychlor	0.00065	2.8	0.0018
Aroclor 1221	Methoxychlor	0.00065	2.8	0.0018
Aroclor 1232	Methoxychlor	0.00065	2.8	0.0018
Aroclor 1242	Methoxychlor	0.00065	2.8	0.0018
Aroclor 1248	Methoxychlor	0.00065	2.8	0.0018
Aroclor 1254	Methoxychlor	0.0013	2.8	0.0036
Aroclor 1260	Methoxychlor	0.0013	2.8	0.0036

Table 6-2 (Continued)

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 2 (CHLOROBENZENES)

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
U037	9	Chlorobenzene	Y	2	4	99	9/4	1.01	2.02	2.8	5.7
U070	87	o-Dichlorobenzene	Y	2	4	90	88/4	1.11	2.22	2.8	6.2
U071	86	m-Dichlorobenzene	N	2	4	90	88/4	1.11	2.22	2.8	6.2
U072	88	p-Dichlorobenzene	Y	2	4	90	88/4	1.11	2.22	2.8	6.2
U127	110	Hexachlorobenzene	Y	10	4	75	150/4	1.33	13.33	2.8	37
U183	136	Pentachlorobenzene	Y	10	4	75	150/4	1.33	13.33	2.8	37
U185	138	Pentachloronitrobenzene	Y	0.36	13	21	110/13	4.76	1.71	2.8	4.8
U207	148	1,2,4,5-Tetrachlorobenzene	Y	5	4	75	150/4	1.33	6.67	2.8	19
Wastewater											
U037	9	Chlorobenzene	Y	0.005	13	130	9/13	1.00	0.0050	2.8	0.014
U070	87	o-Dichlorobenzene	Y	0.0121	11	58	88/11	1.72	0.021	2.8	0.058
U071	86	m-Dichlorobenzene	N	0.02	8	78	88/8	1.28	0.026	2.8	0.072
U072	88	p-Dichlorobenzene	Y	0.0121	11	58	88/11	1.72	0.021	2.8	0.058
U127	110	Hexachlorobenzene	Y	0.0121	11	62	150/11	1.61	0.020	2.8	0.055
U183	136	Pentachlorobenzene	Y	0.011	13	32	110/13	3.13	0.034	2.8	0.096
U185	138	Pentachloronitrobenzene	Y	0.011	13	32	110/13	3.13	0.03	2.8	0.096
U207	148	1,2,4,5-Tetrachlorobenzene	Y	0.005	4	60	150/4	1.67	0.0083	2.8	0.023

* Treatment test number is indicated in Table 4-1.

Table 6-3

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES -
GROUP 3 (CHLOROPHENOXYACETIC ACID AND DERIVATIVES)

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
U240	192	2,4-Dichlorophenoxyacetic acid	Y	0.2	13	20	192/13	5.00	1.00	10.13	10
D016	192	2,4-Dichlorophenoxyacetic acid	Y	0.2	13	20	192/13	5.00	1.00	10.13	10
D017	193	2,4,5-TP (Silvex)	N	0.2	13	20	192/13	5.00	1.00	2.8	2.8
Wastewater											
U240	192	2,4-Dichlorophenoxyacetic acid	Y	0.0012	13	22	192/13	4.55	0.0055	2.42	0.013
D016	192	2,4-Dichlorophenoxyacetic acid	Y	0.0012	13	22	192/13	4.55	0.0055	2.42	0.013
D017	193	2,4,5-TP (Silvex)	N	0.2	13	22	192/13	4.55	0.9091	2.8	2.5

* Treatment test number is indicated in Table 4-1.

Table 6-4

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 4 (CHLORINATED DIPHENYLS)

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
U038	75	Chlorobenzilate	N	0.702	11	30	52/11	3.33	2.34	2.8	6.6
U060	178	p,p'-DDD	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U060	235	o,p'-DDD	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	179	p,p'-DDE	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	236	o,p'-DDE	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	180	p,p'-DDT	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	237	o,p'-DDT	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	178	p,p'-DDD	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U061	235	o,p'-DDD	N	0.013	13,14	42	190/14	2.38	0.03	2.8	0.087
U132	114	Hexachlorophene	N	0.4	6	100	52/6	1.00	0.40	2.8	1.1
D014	190	Methoxychlor	Y	0.013	13	20	190/13	5.00	0.07	2.8	0.18
U247	190	Methoxychlor	Y	0.013	13	20	190/13	5.00	0.07	2.8	0.18
Wastewater											
U038	75	Chlorobenzilate	N	0.1	5	96	52/5	1.04	0.104	2.8	0.29
U060	178	p,p'-DDD	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U060	235	o,p'-DDD	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	179	p,p'-DDE	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	236	o,p'-DDE	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	180	p,p'-DDT	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	237	o,p'-DDT	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	178	p,p'-DDD	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U061	235	o,p'-DDD	N	0.00013	14	102	190/14	1.00	0.00013	2.8	0.00036
U132	114	Hexachlorophene	N	20	5	96	52/5	1.04	20.83	2.8	58
D014	190	Methoxychlor	Y	0.0001	13	77	190/13	1.30	0.00013	2.8	0.00036
U247	190	Methoxychlor	Y	0.0001	13	77	190/13	1.30	0.00013	2.8	0.00036

* Treatment test number is indicated in Table 4-1.

Table 6-5

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PESTICIDES AND CHLOROBENZENES - GROUP 5 (LINDANE AND HEXACHLOROBUTADIENE)

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
U128	111	Hexachlorobutadiene	Y	10	4	107	47/4	1.00	10.00	2.8	28
D013	176	gamma-BHC (Lindane)	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
U129	176	gamma-BHC (Lindane)	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
U129	175	delta-BHC	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
U129	174	beta-BHC	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
U129	173	alpha-BHC	N	0.0066	13,14	28	186/13	3.57	0.02	2.8	0.066
Wastewater											
U128	111	Hexachlorobutadiene	Y	0.011	13	114	47/13	1.00	0.011	2.8	0.031
D013	176	gamma-BHC (Lindane)	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
U129	176	gamma-BHC (Lindane)	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
U129	175	delta-BHC	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
U129	174	beta-BHC	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024
U129	173	alpha-BHC	N	0.00006	14	70	186/14	1.43	0.00009	2.8	0.00024

* Treatment test number is indicated in Table 4-1.

Table 6-6

CALCULATION OF TREATMENT STANDARDS FOR HALOGENATED PHENOLICS

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
U039	76	p-Chloro-m-cresol	N	5	4	110	76/4	1.00	5.00	2.8	14
U048	78	2-Chlorophenol	N	2	4	98	78/4	1.02	2.04	2.8	5.7
U081	90	2,4-Dichlorophenol	Y	5	4	98	78/4	1.02	5.10	2.8	14
U082	91	2,6-Dichlorophenol	Y	5	4	98	78/4	1.02	5.10	2.8	14
Wastewater											
U039	76	p-Chloro-m-cresol	N	0.02	7	91	76/7	1.10	0.022	2.8	0.062
U048	78	2-Chlorophenol	N	0.02	8	106	78/8	1.00	0.020	2.8	0.056
U081	90	2,4-Dichlorophenol	Y	0.011	13	59	78/13	1.69	0.019	2.8	0.052
U082	91	2,6-Dichlorophenol	Y	0.005	4	78	78/4	1.28	0.0064	2.8	0.018

* Treatment test number is indicated in Table 4-1.

Table 6-7

CALCULATION OF TREATMENT STANDARDS FOR PHENOLICS

Waste Code	BDAT #	Constituent	Detection Status in Untreated or Treated Waste (Y or N)	Detection Limit (ppm)	Detection Limit Taken From Test #(s)*	Matrix Spike Recovery (%)	Recovery Data Transferred From (BDAT #/Test #)*	Accuracy Correction Factor	Corrected Detection Limit (ppm)	Variability Factor	Treatment Standard (ppm)
Nonwastewater											
P020	73	2-sec-Butyl-4,6-dinitrophenol	Y	0.36	14	41	73/14	2.44	0.88	2.8	2.5
P047	100	4,6-Dinitro-o-cresol	N	50	4	97	142/4	1.03	51.55	2.8	140
P048	101	2,4-Dinitrophenol	N	50	4	97	142/4	1.03	51.55	2.8	140
U052	82	Cresol (m- and p- isomers)	Y	1	8	87	76/8	1.15	1.15	2.8	3.2
U052	81	o-Cresol	Y	2	4	110	76/4	1.00	2.00	2.8	5.6
U101	96	2,4-Dimethylphenol	N	5	4	110	76/4	1.00	5.00	2.8	14
U170	127	4-Nitrophenol	N	10	4	43	127/4	2.33	23.26	2.8	65
U188	142	Phenol	Y	2	4	90	142/4	1.11	2.22	2.8	6.2
U201	146	Resorcinol	N	0.5	1,5	80	142/1	1.25	0.63	2.8	1.8
Wastewater											
P020	73	2-sec-Butyl-4,6-dinitrophenol	Y	0.013	14	122	73/14	1.00	0.013	2.8	0.036
P047	100	4,6-Dinitro-o-cresol	N	0.063	14	122	73/14	1.00	0.063	2.8	0.18
P048	101	2,4-Dinitrophenol	N	0.063	14	98	127/14	1.02	0.064	2.8	0.18
U052	82	Cresol (m- and p- isomers)	Y	0.01	8	103	76/8	1.00	0.010	2.8	0.028
U052	81	o-Cresol	Y	0.002	4	85	76/4	1.18	0.0024	2.8	0.0066
U101	96	2,4-Dimethylphenol	N	0.013	14	81	76/14	1.23	0.016	2.8	0.045
U170	127	4-Nitrophenol	N	0.063	14	98	127/14	1.00	0.063	2.8	0.18
U188	142	Phenol	Y	0.013	14	40	142/14	2.50	0.033	2.8	0.091
U201	146	Resorcinol	N	1	5,6	34	142/5	2.94	2.94	2.8	8.2

* Treatment test number is indicated in Table 4-1.

7.0 ACKNOWLEDGEMENTS

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The following personnel from Radian Corporation were involved in preparing this document: Mr. John Williams, Program Manager; Ms. Lori Stoll, Project Director; and the Radian engineering team, Ms. Debra Falatko and Ms. Chrisanti Haretos.

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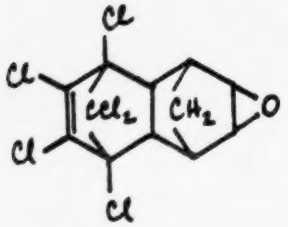
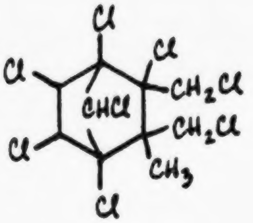
Appendix A

CHEMICAL STRUCTURES OF WASTE CONSTITUENTS INCLUDED IN THIS DOCUMENT

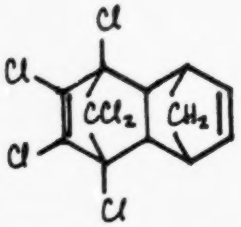
Halogenated Pesticides and Chlorobenzenes
Group 1


Cl
Cl
CCl$_2$
CH$_2$
O
Cl
Cl

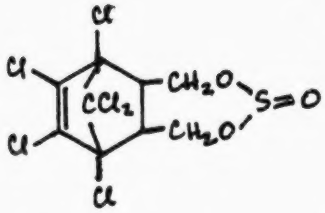
D012 Endrin >0.02 mg/l
P037 Dieldrin } (stereoisomers)
P051 Endrin


Cl
Cl
Cl
CHCl
CH$_2$Cl
CH$_2$Cl
Cl
CH$_3$
Cl

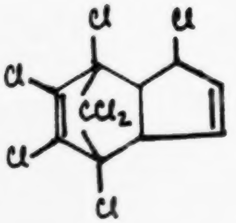
D015 Toxaphene >0.5 mg/l
P123 Toxaphene
(also regulated in K041 and K098)


Cl
Cl
CCl$_2$
CH$_2$
Cl
Cl

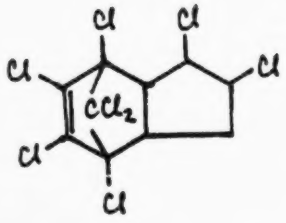
P004 Aldrin } (stereoisomers)
P060 Isodrin


Cl
Cl
CCl$_2$
CH$_2$O
S=O
CH$_2$O
Cl
Cl

P050 Endosulfan

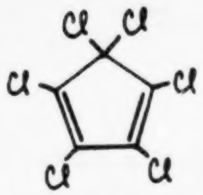

Cl
Cl
Cl
CCl$_2$
Cl
Cl

P059 Heptachlor
(also regulated in K032 and K097)


Cl
Cl
Cl
Cl
CCl$_2$
Cl
Cl

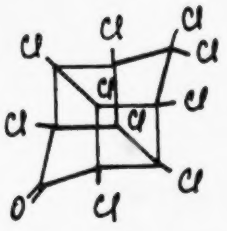
U036 Chlordane
(also regulated in K032 and K097)

Halogenated Pesticides and Chlorobenzenes
Group 1 (Continued)



Cl
Cl
Cl
Cl
Cl
Cl

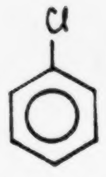
U130 Hexachlorocyclopentadiene
(also regulated in K032, K033,
K034, and K097)



Cl
Cl
Cl
Cl
Cl
Cl
Cl
Cl
Cl
Cl
O

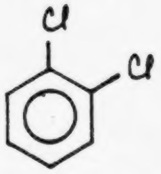
U142 Kepone

Halogenated Pesticides and Chlorobenzenes
Group 2



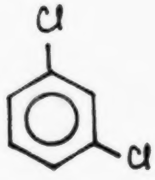
U037 Chlorobenzene

(also regulated in K085
and K105)



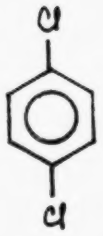
U070 1,2-Dichlorobenzene

(also regulated in K042, K085,
and K105)



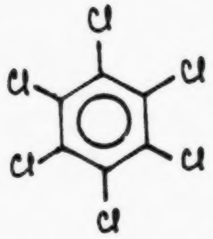
U071 1,3-Dichlorobenzene

(also regulated in K042, K085,
and K105)



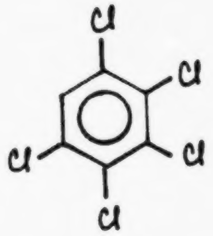
U072 1,4-Dichlorobenzene

(also regulated in K042, K085,
and K105)



U127 Hexachlorobenzene

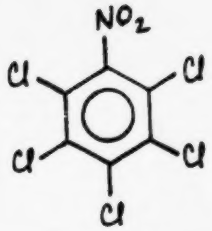
(also regulated in K042
and K085)



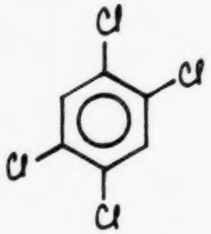
U183 Pentachlorobenzene

(also regulated in K042 and K085)

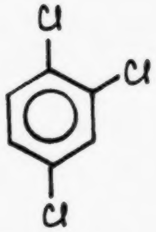
Halogenated Pesticides and Chlorobenzenes
Group 2 (Continued)



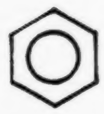
U185 Pentachloronitrobenzene



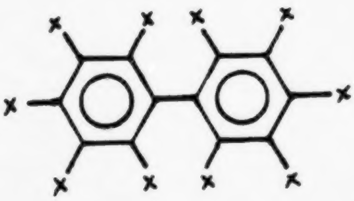
U207 1,2,4,5-Tetrachlorobenzene
(also regulated in K042 and K085)



1,2,4-Trichlorobenzene
(regulated in K042 and K085)



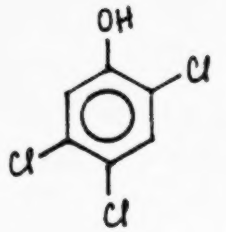
Benzene
(regulated in K085 and K105)



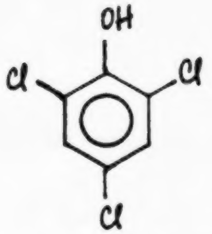
x = H or Cl

Polychlorinated biphenyls; PCBs
(regulated in K085)

Halogenated Pesticides and Chlorobenzenes
Group 2 (Continued)

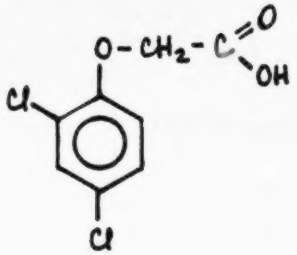


2,4,5- Trichlorophenol
(regulated in K105)



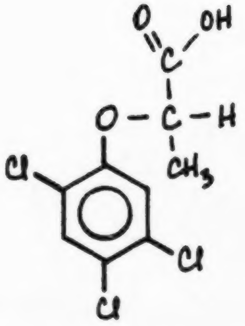
2,4,6- Trichlorophenol
(regulated in K105)

Halogenated Pesticides and Chlorobenzenes
Group 3



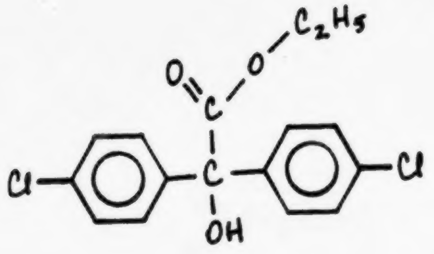
U240 2,4-Dichlorophenoxyacetic acid; 2,4-D

D016 2,4-D >10.0 mg/l

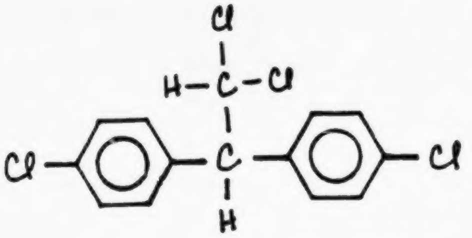


D017 2-(2,4,5-Trichlorophenoxy)propionic acid >1.0 mg/l

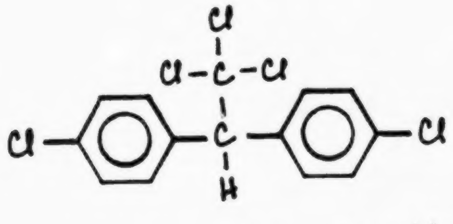
Halogenated Pesticides and Chlorobenzenes
Group 4



U038 Chlorobenzilate

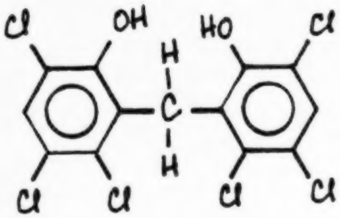


U060 Dichlorodiphenyldichloroethane; DDD

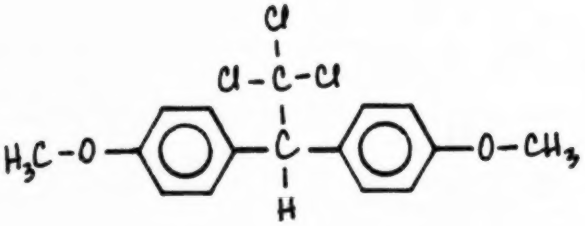


U061 Dichlorodiphenyltrichloroethane; DDT

Halogenated Pesticides and Chlorobenzenes
Group 4 (Continued)



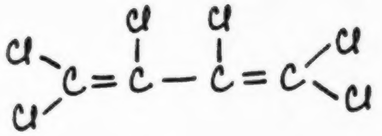
U132 Hexachlorophene



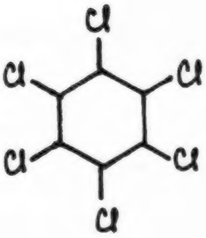
U247 Methoxychlor

D014 Methoxychlor >10.0 mg/L

Halogenated Pesticides and Chlorobenzenes
Group 5



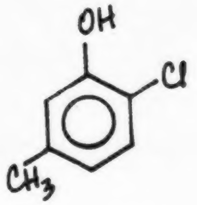
U128 Hexachlorobutadiene



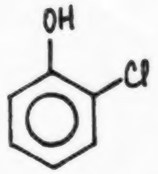
U129 Lindane

D013 Lindane >0.4 mg/l

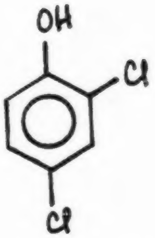
Halogenated Phenols Group



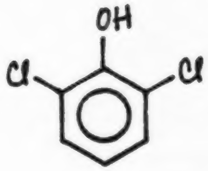
U039 p-Chloro-m-cresol



U048 2-Chlorophenol

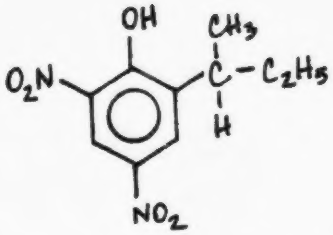


U081 2,4-Dichlorophenol

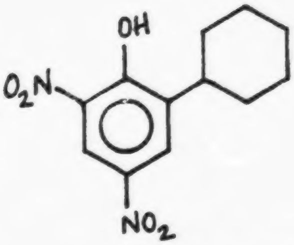


U082 2,6-Dichlorophenol

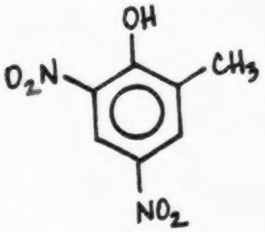
Phenolics (Continued)


OH
CH_3
C_2H_5
H
O_2N
NO_2

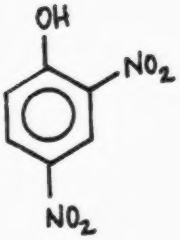
P020 2-sec-Butyl-4,6-dinitrophenol



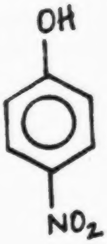
P034 2-Cyclohexyl-4,6-dinitrophenol


OH
O_2N
CH_3
NO_2

P047 4,6-Dinitro-o-cresol
(and salts)

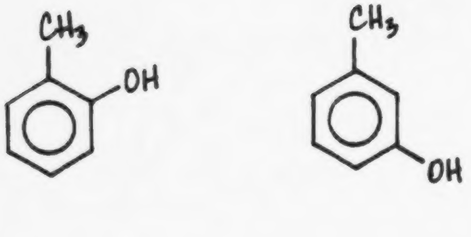


P048 2,4-Dinitrophenol

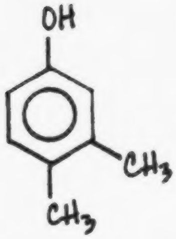


U170 4-Nitrophenol

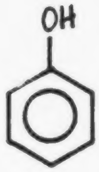
Phenolics


CH3
OH
CH3
OH
CH3
OH

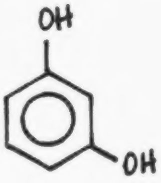
U052 Cresols (o-, m-, and p- isomers)



U101 2,4-Dimethylphenol



U188 Phenol



U201 Resorcinol

Appendix B

SUMMARY OF PLANT CODES

Table B-1

PLANT CODE REFERENCE LIST

Plant (Test Number)	Facility/Location	Reference No.
1	U.S. EPA Combustion Research Facility, Jefferson, AR	10
2	U.S. EPA Combustion Research Facility, Jefferson, AR	11
3	John Zink Test Facility, Tulsa, OK	12
4	Rollins Environmental Services (TX) Inc., Deer Park, TX	13
5	U.S. EPA Combustion Research Facility, Jefferson, AR	14
6	U.S. EPA Combustion Research Facility Jefferson, AR	15
7	Amoco Oil Company, Whiting, IN	16, 17
8	U.S. EPA combustion Research Facility, Jefferson, AR	18
9	John Zink Test Facility, Tulsa, OK	19
10	John Zink Test Facility, Tulsa, OK	20
11	ENSCO, El Dorado, AR	21
12	John Zink Test Facility, Tulsa, OK	22
13	John Zink Test Facility, Tulsa, OK	23
14	John Zink Test Facility, Tulsa, OK	23

Appendix C

ACCURACY CORRECTION OF TREATMENT PERFORMANCE DATA

Appendix C

ACCURACY CORRECTION OF TREATMENT PERFORMANCE DATA

C.1 K Wastes

The treatment performance data used to determine treatment standards for pesticides wastes were adjusted to account for analytical interferences associated with the chemical matrices of the samples. Generally, treatment performance data were corrected for accuracy as follows: (1) a matrix spike recovery was determined for each BDAT List constituent detected in the untreated or treated waste; (2) an accuracy correction factor was determined for each of the above constituents by dividing 100 by the matrix spike recovery (percent) for that constituent; and (3) treatment performance data for each BDAT List constituent detected in the untreated or treated waste were corrected by multiplying the reported concentration of each constituent by its corresponding accuracy correction factor. The procedure for accuracy correction of the data is described in further detail below.

Matrix spike recoveries are developed by analyzing a sample of a treated waste for a constituent and then re-analyzing the sample after the addition of a known amount of the same constituent (i.e., spike) to the sample. The matrix spike recovery represents the total amount of constituent recovered after spiking, minus the initial concentration of the constituent in the sample, and the result divided by the spike concentration of the constituent.

Matrix spike recoveries used to adjust the treatment performance data for pesticides wastes are shown in Tables C-1 and C-2. Duplicate matrix spikes were performed for some BDAT List constituents. If a duplicate matrix spike was performed for a constituent, the matrix spike recovery used for that constituent was the lower of the two values from the first matrix spike and the duplicate spike.

Where a matrix spike was not performed for an organic constituent, the matrix spike recovery for that constituent was derived from the average matrix spike recoveries of the appropriate group of constituents (e.g., volatile or semivolatile organics) for which recovery data were available. In these cases, the matrix spike recoveries for all volatiles or semivolatiles from the first matrix spike were averaged. Similarly, an average matrix spike recovery was calculated for the duplicate matrix spike recoveries. The lower of the two average matrix spike recoveries of the volatile or semivolatile group was used for any volatile or semivolatile constituent for which no matrix spike was performed.

An accuracy correction factor of 1 was used when both the matrix spike and duplicate matrix spike recoveries exceeded 100%, so that the data were not adjusted to concentrations below the detection limits. Matrix spike values of less than 20% are not acceptable and were not used to correct detection limits, nor included in average value calculations.

The accuracy correction factors for the data used to calculate treatment standards for pesticides wastes are presented in Table C-3. The uncorrected detection limits used for constituents proposed for regulation are presented in Table C-4. The corrected treatment concentrations used to calculate proposed treatment standards are presented in Table C-5.

C.2 U, P, and D Wastes

As described in Section 6.2, matrix spike recoveries were used to correct detection limits to account for analytical interferences associated with the chemical matrices of the samples. For the U, P, and D wastes, in cases where a matrix spike was not performed for a waste constituent in the treatment test from which the detection limit was transferred, the matrix spike recovery for a similar constituent in that treatment test was transferred to that constituent. An accuracy correction factor was determined for each constituent by dividing 100 by the matrix spike recovery (percent) for that constituent.

Table C-6 presents the matrix spike recoveries obtained in each of the 14 incineration tests. Matrix spike recoveries and accuracy correction factors used for each constituent are included in Tables 6-1 through 6-7 in Section 6.

Table C-1

MATRIX SPIKE RECOVERIES IN KILN ASH FROM TEST 13

Spike Constituent	Original Amount Found* (ppm)	Sample Result			Duplicate Sample Result		
		Amount Spiked (ppm)	Amount Recovered (ppm)	Percent Recovery[1] (%)	Amount Spiked (ppm)	Amount Recovered (ppm)	Percent Recovery[1] (%)
Semivolatile Organics[2]:							
52. Acenaphthene	ND	3.240	1.640	51	3.270	0.784	24
70. Bis(2-ethylhexyl)-phthalate	ND	0.200	0.172	86	0.200	0.156	78
73. 2-sec-Butyl-4,6-nitrophenol	ND	0.200	0.129	65	0.200	0.025	13
76. p-Chloro-m-cresol	ND	6.490	5.440	84	6.540	5.740	88
78. 2-Chlorophenol	ND	6.490	3.150	49	6.540	2.740	42
88. 1,4-Dichlorobenzene	ND	3.240	0.842	26	3.270	0.759	23
102. 2,4-Dinitrotoluene	ND	3.240	2.370	73	3.270	1.820	56
105. N-Nitroso-di-n-propylamine	ND	3.240	1.890	58	3.270	1.640	50
110. Hexachlorobenzene	ND	0.100	0.054	54	0.100	0.021	21
117. Isosafrole	ND	0.100	0.034	34	0.100	0.028	28
127. 4-Nitrophenol	ND	6.490	5.900	91	6.540	3.140	48
139. Pentachlorophenol	ND	6.490	4.820	74	6.540	ND	0
142. Phenol	ND	6.490	4.540	70	6.540	3.990	61
144. Pronamide	ND	0.100	0.099	99	0.100	0.069	69
145. Pyrene	ND	3.240	1.600	49	3.270	ND	0
150. 1,2,4-Trichlorobenzene	ND	3.240	0.965	30	3.270	0.828	25
Organochlorine Pesticides[3]:							
186. Heptachlor	ND	0.06462	0.03490	54	0.06545	0.01836	28
190. Methoxychlor	ND	0.06462	0.01026	16	0	0	200

ND - Not detected.

*For constituents not detected above the detection limit (ND), the original amount found is considered as zero in calculating percent recovery.

[1] Percent recovery = 100 x $((C_i-C_o)/C_t)$, where C_o is the concentration of the original amount found, C_i is the concentration of the amount recovered, and C_t is the concentration of the amount spiked.

[2] The averages of the semivolatile organic matrix spike and duplicate spike recoveries were, respectively, 62% and 47%.

[3] The averages of the organochlorine pesticides matrix spike and duplicate spike recoveries were, respectively, 54% and 28%.

Table C-2

MATRIX SPIKE RECOVERIES IN COMBUSTION GAS SCRUBBER WATER FROM TEST 13

Spike Constituent	Original Amount Found* (ppm)	Sample Result: Amount Spiked (ppm)	Sample Result: Amount Recovered (ppm)	Sample Result: Percent Recovery[1] (%)	Duplicate Sample Result: Amount Spiked (ppm)	Duplicate Sample Result: Amount Recovered (ppm)	Duplicate Sample Result: Percent Recovery[1] (%)
Semivolatile Organics[2]:							
52. Acenaphthene	ND	0.100	0.053	53	0.100	0.064	64
70. Bis(2-ethyl)hexyl)-phthalate	ND	0.100	0.082	82	0.100	0.099	99
73. 2-sec-Butyl-4,6-nitrophenol	ND	0.200	ND	0	0.200	ND	0
76. p-Chloro-m-cresol	ND	0.200	0.192	96	0.200	0.144	72
78. 2-Chlorophenol	ND	0.200	0.135	68	0.200	0.117	59
88. 1,4-Dichlorobenzene	ND	0.100	0.031	31	0.100	0.034	34
102. 2,4-Dinitrotoluene	ND	0.100	0.038	38	0.100	0.037	37
105. N-Nitroso-di-n-propylamine	ND	0.100	0.070	70	0.100	0.067	67
110. Hexachlorobenzene	ND	0.100	0.048	48	0.100	0.032	32
117. Isosafrole	ND	0.100	0.070	70	0.100	0.077	77
127. 4-Nitrophenol	ND	0.200	ND	0	0.200	ND	0
139. Pentachlorophenol	ND	0.200	0.182	91	0.200	0.154	77
142. Phenol	ND	0.200	0.159	80	0.200	0.124	62
144. Pronamide	ND	0.100	0.079	79	0.100	0.090	90
145. Pyrene	ND	0.100	0.074	74	0.100	0.066	66
150. 1,2,4-Trichlorobenzene	ND	0.100	0.035	35	0.100	0.035	35
Organochlorine Pesticides[3]:							
186. Heptachlor	ND	0.0010	0.00067	67	0.0010	0.00064	64
190. Methoxychlor	ND	0.0010	0.00077	77	0.0010	0.00078	78

ND - Not detected.

*For constituents not detected above the detection limit (ND), the original amount found is considered as zero in calculating percent recovery.

**Not Calculable.

[1] Percent recovery = 100 x $((C_i - C_o)/C_t)$, where C_o is the concentration of the original amount found, C_i is the concentration of the amount recovered, and C_t is the concentration of the amount spiked.

[2] The averages of the semivolatile organic matrix spike and duplicate spike recoveries were, respectively, 65% and 62%.

[3] The averages of the organochlorine pesticides matrix spike and duplicate spike recoveries were, respectively, 72% and 71%.

Table C-3

SUMMARY OF ACCURACY CORRECTION FACTORS

BDAT List Constituent	Accuracy Correction Factors[a] Kiln Ash	 Scrubber Water
Volatile Organics		
4. Benzene	4.76	3.13
9. Chlorobenzene	4.76	3.13
Semivolatile Organics		
78. 2-Chlorophenol	4.76	3.13
86. m-Dichlorobenzene	4.76	3.13
87. o-Dichlorobenzene	4.76	3.13
88. p-Dichlorobenzene	4.76	3.13
110. Hexachlorobenzene	4.76	3.13
112. Hexachlorocyclopentadiene	2.13	1.61
136. Pentachlorobenzene	4.76	3.13
142. Phenol	4.76	3.13
148. 1,2,4,5-Tetrachlorobenzene	4.76	3.13
150. 1,2,4-Trichlorobenzene	4.76	3.13
151. 2,4,5-Trichlorophenol	4.76	3.13
152. 2,4,6-Trichlorophenol	4.76	3.13
Organochlorine Pesticides		
177. Chlordane	3.57	1.41
186. Heptachlor	3.57	1.56
187. Heptachlor epoxide	3.57	1.56
190. Methoxychlor	3.57	1.30
191. Toxaphene	3.57	1.41
200. Aroclor 1016	3.57	1.30
201. Aroclor 1221	3.57	1.30
202. Aroclor 1232	3.57	1.30
203. Aroclor 1242	3.57	1.30
204. Aroclor 1248	3.57	1.30
205. Aroclor 1254	3.57	1.30
206. Aroclor 1260	3.57	1.30

[a] The accuracy correction factor is equal to 100 divided by the lowest matrix spike percent recovery.

Table C-4

UNCORRECTED DETECTION LIMITS FROM TEST 13

BDAT List Constituent	Detection Limit in Treatment Residuals (ppm)			
	Sample Set 1	Sample Set 2	Sample Set 3	Sample Set 4
NONWASTEWATERS				
Semivolatile Organics:				
110. Hexachlorobenzene	0.33	0.36	0.31	0.33
112. Hexachlorocyclopentadiene	0.33	0.36	0.31	0.33
Organochlorine Pesticides:				
177. Chlordane	0.013	0.013	0.013	0.013
186. Heptachlor	0.0066	0.0066	0.0066	0.0066
190. Methoxychlor	0.013	0.013	0.013	0.013
WASTEWATERS				
Semivolatile Organics:				
110. Hexachlorobenzene	0.01	0.01	0.011	0.011
112. Hexachlorocyclopentadiene	0.01	0.01	0.011	0.011
Organochlorine Pesticides:				
177. Chlordane	0.0001	0.0001	0.0001	0.0001
186. Heptachlor	0.00005	0.00005	0.00005	0.00005
190. Methoxychlor	0.0001	0.0001	0.0001	0.0001

Table C-5

ACCURACY CORRECTED DATA USED TO CALCULATE PROPOSED TREATMENT STANDARDS FOR PESTICIDE K-WASTES

BDAT List Constituent	Corrected Total Concentration In Treatment Residuals (ppm)			
	Sample Set 1	Sample Set 2	Sample Set 3	Sample Set 4
NONWASTEWATERS				
Semivolatile Organics:				
110. Hexachlorobenzene	1.57	1.71	1.48	1.57
112. Hexachlorocyclopentadiene	0.702	0.766	0.660	0.702
Organochlorine Pesticides:				
177. Chlordane	0.0464	0.0464	0.0464	0.0464
186. Heptachlor	0.0236	0.0232	0.0236	0.0236
190. Methoxychlor	0.0464	0.0464	0.0464	0.0464
WASTEWATERS				
Semivolatile Organics:				
110. Hexachlorobenzene	0.0313	0.0313	0.0344	0.0344
112. Hexachlorocyclopentadiene	0.0161	0.0161	0.0177	0.0177
Organochlorine Pesticides:				
177. Chlordane	0.000140	0.000140	0.000140	0.000140
186. Heptachlor	0.0000780	0.0000780	0.0000780	0.0000780
190. Methoxychlor	0.000129	0.000129	0.000129	0.000129

Table C-6

MATRIX SPIKE RECOVERIES USED TO ADJUST DETECTION LIMITS

BDAT #	Constituent	Test 1		Test 2		Test 3		Test 4		Test 5		Test 6		Test 7	
		Ash	Scrubber Water	Ash	Scrubber Water	Ash	Scrubber Water	Ash	Scrubber Water	Ash	Scrubber Water	Ash	Scrubber Water	Ash	Scrubber Water
	Volatile Organics:														
1	Acetonitrile					79,80	66,88								
2	Acrolein					80,47	1.3,0.84								
3	Acrylonitrile					110,108	44,66								
4	Benzene	88,86	92,120	78,88	90,85	141,146	103,109	90,85	84,88	104,104	112,112	104,104,88,94	85,88,85,87	88	111,117
6	Chlorobenzene	124,120	120,104	102,112	80,95	107,107	98,102	99,100	118,92	112,112	120,118	108,108,114,120	121,108,132,129	46	118,118
24	1,1-Dichloroethylene		92,112	88,95	100,97	99,104	71,56	85,79	48,44	140,138	180,184	88,[illegible],58,86	50,39,59,50	96	154,156
229	Methyl isobutyl ketone														
38	Methylene Chloride														
43	Toluene	108,108	120,120	99,110	103,99	113,117	88,97			122,107	118,118	124,84,186,185	109,116,122,118	80	110,119
45	1,1,1-Trichloroethane														
47	Trichloroethene	88,84	84,84	87,77	69,84	104,105	91,93	107,112	84,108	104,108	84,80	84,84,80,80	79,76,80,80	78	112,118
215	1,2-Xylene														112,118
216,217	1,3-Xylene and 1,4-Xylene														109,110
216-217	Total Xylenes														
	Semivolatile Organics:														
51	Acenaphthalene														
52	Acenaphthene	120,120	110,110	0,3.4	81,86			110,110	102,102	96,96	96,98	103,100	140,130	88,83	92,57
62	Benzo(a)pyrene														96,59
70	Bis(2-ethylhexyl)phthalate														94,85
73	2-sec-Butyl-4,6-dinitrophenol			113,88	88,70										
76	p-Chloro-m-cresol	90,95	29,22	35,68	80,73			110,120	87,85	88,88	49,47	88,88	85,85	58,57	133,91
78	2-Chlorophenol	100,105	28,20	59,53	81,85			98,100	81,78	107,109	46,49	75,75	95,90	70,70	115,98
80	Chrysene														108,65
87	p-Dichlorobenzene													75,78	
88	o-Dichlorobenzene	84,84	85,87	48,48	51,61			90,99	88,70	89,90	68,68	74,74	94,79		76,84
98	Di-n-butyl phthalate														108,47
102	2,4-Dinitrotoluene	120,120	79,84	0,0	21,17			107,110	86,84	118,118	114,120	109,112	130,120	54,52	111,58
105	Di-n-propylnitrosamine	81,82	70,66	87,82	70,56			120,130	100,92	40,26	42,44	82,56	88,81	70,70	93,70
109	Fluorene														105,58
110	Hexachlorobenzene														
117	Isosafrole														
121	Naphthalene														118,85
127	4-Nitrophenol	100,90	1.5,0.8	1.2,2.6	0,0			97,110	82,43	120,114	77,90	100,88	140,120	32,31	76,82
139	Pentachlorophenol	85,105	3,1.7	0,0	80,85			98,88	58,45	98,91	80,84	48,33	85,90	34,34	51,59
141	Phenanthrene														99,71
142	Phenol	86,80	30,22	72,85	85,61			90,97	74,70	98,94	36,34	70,67	95,85	65,65	109,59
144	Pronamide														
145	Pyrene	98,100	110,110	0,0	82,80			120,92	86,86	94,82	88,100	47,28	110,110	58,53	121,92
150	1,2,4-Trichlorobenzene	85,100	110,120	30,30	72,54			75,80	80,88	90,90	72,72	85,88	100,94	90,98	89,88
	Organochlorine Pesticides:														
176	gamma-BHC			62,75	60,56							64,56	84,75		
181	Dieldrin											50,39	48,41		
186	Heptachlor														
187	Heptachlor epoxide			75,88	84,80							72,58	75,88		
190	Methoxychlor			116,145	94,82							38,38	110,94		
	Phenoxyacetic Acid Herbicides:														
192	2,4-Dichlorophenoxyacetic acid			42,69	89,117							55,39	99,94		
193	Silvex											64,45	97,89		
194	2,4,5-T											39,27	82,68		

Table C-6 (continued)

MATRIX SPIKE RECOVERIES USED TO ADJUST DETECTION LIMITS

BDAT # Constituent	Test 8 Ash	Test 8 Scrubber Water	Test 9 Ash	Test 9 Scrubber Water	Test 10 Ash	Test 10 Scrubber Water	Test 11 Ash	Test 11 Scrubber Water	Test 12 Ash	Test 12 Scrubber Water	Test 13 Ash	Test 13 Scrubber Water	Test 14 Ash	Test 14 Scrubber Water
Volatile Organics:														
1 Acetonitrile														
2 Acrolein														
3 Acrylonitrile														
4 Benzene	100,98	106,108	102,106	80,82	104,108	92,90	126,130	86,90		96,96	117,158	98,103	103,97	88,70
9 Chlorobenzene	106,106	112,108	104,110	100,102	106,110	114,110	90,108	110,112		116,112	92,56	121,130	115,100	115,87
24 1,1-Dichloroethylene	114,114	110,108	100,96	80,82	126,130	78,74	80,122	80,80		48,48	35,32	73,76	75,73	89,57
229 Methyl isobutyl ketone											86,117	131,140	46,43	154,121
38 Methylene Chloride											300,309	109,127	120,124	101,81
43 Toluene	106,104	124,124	108,116	90,92	112,114	104,102	170,222	114,114		104,100	243,153	113,122	109,93	106,81
45 1,1,1-Trichloroethane											539,886	122,134	109,110	113,105
47 Trichloroethene	114,114	114,112	116,126	98,102	112,118	114,110	178,216	106,106		92,92	210,294	114,123	109,103	115,66
215 1,2-Xylene														
216,217 1,3-Xylene and 1,4-Xylene														
215-217 Total Xylenes											81,23	92,99	92,91	92,83
Semivolatile Organics:														
51 Acenaphthalene			41,39	55,58	73,74	82,85								
52 Acenaphthene	83,91	104,84					30,88	78,80		76,80	51,24	53,64	80,54	50,55
62 Benzo(a)pyrene														
70 Bis(2-ethylhexyl)phthalate											86,78	82,88	78,71	105,112
73 2-sec-Butyl-4,6-dinitrophenol											65,13	0,0	41,41	122,123
76 p-Chloro-m-cresol	92,87	107,103	47,44	88,73	66,84	104,109	98,135			90,95	88,84	96,72	90,79	81,82
78 2-Chlorophenol	78,83	106,108	41,39	82,59	82,58	85,92	76,102			75,70	49,42	68,59	53,41	51,74
80 Chrysene														
87 p-Dichlorobenzene														
88 o-Dichlorobenzene	79,88	78,87	40,39	33,33	75,70	48,49	72,90	64,58		40,37	26,23	31,34	29,17	30,36
98 Di-n-butyl phthalate														
102 2,4-Dinitrotoluene	121,109	125,124	48,47	42,53	58,58	92,94	38,100	114,114		25,25	73,56	38,37	71,83	71,77
106 Di-n-propylnitrosamine	92,94	104,98	46,45	59,60	64,61	91,92	110,118	132,118		75,85	58,50	70,67	53,46	56,72
109 Fluorene														
110 Hexachlorobenzene											54,21	48,32	74,139	63,71
117 Isosafrole											34,28	70,77	44,39	48,60
121 Naphthalene														
127 4-Nitrophenol	37,35	117,118	33,32	0,0	22,21	113,127	50,90			100,120	91,48	0,0	77,64	110,98
139 Pentachlorophenol	7,11	107,85	30,25	51,53	38,35	56,62	27,84			70,85	74,0	91,77	77,89	103,11
141 Phenanthrene														
142 Phenol	77,80	98,93	41,40	60,58	65,61	100,107	101,122			80,55	70,81	90,92	70,80	40,72
144 Pronamide											89,88	79,90	92,84	25,12
145 Pyrene	34,39	143,146	48,45	82,83	85,79	98,102	8,82	88,82		52,82	49,0	74,66	73,86	47,48
150 1,2,4-Trichlorobenzene	84,89	77,85	41,38	40,41	75,76	52,54	80,90	62,84		37,35	30,25	35,35	38,24	32,38
Organochlorine Pesticides:														
178 gamma-BHC														
181 Dieldrin														
186 Heptachlor											54,28	67,64	88,83	70,73
187 Heptachlor epoxide														
190 Methoxychlor											16,0	77,78	0,42	107,102
Phenoxyacetic Acid Herbicides:														
182 2,4-Dichlorophenoxyacetic acid											0,0	22,172	0,0	0,0
183 Silvex											0,0	0	0,0	0,0
184 2,4,5-T											0,0	0	0,0	0,0

Appendix D

VARIABILITY FACTOR CALCULATIONS

VARIABILITY FACTOR CALCULATIONS

As noted in Section 6.1, the variability factor accounts for the variability inherent in treatment system performance, treatment residual collection, and treatment sample analysis. For more information on calculation of variability factors, see EPA's Methodology for Developing BDAT Treatment Standards (Reference 1).

A variability factor was calculated for a constituent when the test from which the detection limit was transferred contained the constituent at concentrations above the detection limit in the treatment residual (ash or scrubber water). This occurred with one constituent 2,4-D, and is reflected in proposed treatment standard calculations for D016 and U240 nonwastewaters and wastewaters summarized in Table 6-3. The calculation of variability factors for 2,4-D nonwastewaters and wastewaters and is shown in Table D-1.

Table D-1

VARIABILITY FACTOR CALCULATIONS

D016 AND U240 NONWASTEWATERS

INPUT DATA:

Constituent: 2,4-D
BDAT Number: 192
Accuracy Correction Factor: 1.45

Sample Set	Unadjusted Value (ppm)	A or DL	Adjusted Value (ppm)	ln of Adj Values
1	0.21	A	0.03045	-3.49166
2	0.2	DL	0.29	-1.23787
3	0.2	DL	0.29	-1.23787
4	0.2	DL	0.29	-1.23787

RESULTS:

Mean of Adj Values = 0.2251
Mean of lns = -1.8013
STD of lns = 1.1269
C99 = 2.2804
VF = 10.1300

A - Actual value detected in treatment residual.
DL - Detection limit (given if undetected in treatment residual).

Table D-1 (Continued)

VARIABILITY FACTOR CALCULATIONS

D016 AND U240 WASTEWATERS

INPUT DATA:

Constituent: 2,4-D
BDAT Number: 192
Accuracy Correction Factor: 4.55

Sample Set	Unadjusted Value (ppm)	A or DL	Adjusted Value (ppm)	ln of Adj Values
1	0.0074	A	0.03367	-3.39114
2	0.0069	A	0.031395	-3.46110
3	0.011	A	0.05005	-2.99473
4	0.0041	A	0.018655	-3.98164

RESULTS:

Mean of Adj Values = 0.0334
Mean of lns = -3.4572
STD of lns = 0.4055
C99 = 0.0811
VF = 2.4244

A - Actual value detected in treatment residual.
DL - Detection limit (given if undetected in treatment residual).